THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[Registered as a Newspaper.]

Vol. XXXII. No. 805.] LONDON, OCTOBER 15, 1878. [30th Year.] Price 6d.

COOKE BROS.

See Page 552.

26, 27, & 28, FENCHURCH ST.,

LONDON, E.C.

GENUINE TORBAY PAINT

And SPECIAL GASOMETER PAINT.

Several Prize Medals. Established over 20 Years.

These Paints are now used in over 200 Country Gas-Works, and by all the London Gas Companies, on Gas-holders, Scrubbers, Purifiers, &c. Also used by the Admiralty, War Office, Railway Companies, Founders, &c. They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations; do not crack, blister, or flake off; will cover tar effectually.

The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.

Supplied, mixed ready for use, or in paste, as desired.

TORBAY PAINT COMPANY.

Proprietors: STEVENS & CO.,

21, GREAT WINCHESTER STREET, LONDON.

Works: BRIXHAM, TORBAY.

THOMAS PROUD,

BROOKFIELD GAS APPARATUS WORKS,

103, ICKNIELD STREET EAST, BIRMINGHAM.

CONTRACTOR FOR

LAYING MAINS

FOR

Gas, Water, & Sanitary Purposes,

AND MANUFACTURER OF

WOOD GRIDS

FOR

SCRUBBERS AND PURIFIERS.

COWEN'S PATENT FIRE-CLAY RETORTS.

JOSEPH COWEN and CO.,

BLAYDON BURN, BLAYDON-ON-TYNE,

Were the only parties to whom a Prize Medal was awarded at the Great Exhibition of 1851, for "Gas-Retorts and other Objects in Fire-Clay," and they were also awarded at the International Exhibition of 1862, the Prize Medal for "Gas-Retorts, Fire-Bricks, &c., for Excellence of Quality."

J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.

COWEN'S GARESFIELD COALS.

Jos. Cowen & Co. are the only Manufacturers of Fire-Bricks and Clay Retorts at Blaydon Burn.

JOHN RUSSELL & CO.,

LIMITED,

Established at the commencement of Gas Lighting,

Manufacturers of

TUBES AND FITTINGS.

THREE PRIZE MEDALS,

Paris, 1878.

Head London Office:

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ALMA TUBE-WORKS, WALSALL;

OLD PATENT TUBE-WORKS, WEDNESBURY.

JOHN BENT & SON,

BELL BARN ROAD, BIRMINGHAM,

MANUFACTURERS OF

WET AND DRY GAS-METERS,

LICENSEES AND MANUFACTURERS OF

HUNT'S

PATENT COMPENSATING METERS,

STREET-LAMPS, &c., &c.

Established 1830.

THOMAS PIGGOTT & CO.,

SPRING HILL, BIRMINGHAM,

MANUFACTURERS OF

TELESCOPIC & SINGLE GASHOLDERS,

CAST & WROUGHT IRON TANKS FOR DITTO,

And Gas Apparatus of every Description.

Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.

Sugar, Saltpetre, and all kinds of Pans.

Roofs, Girders, and Bridges, and General Smith's Work.

J. & H. ROBUS,

BUILDERS AND CONTRACTORS

FOR THE

ERECTION AND REBUILDING OF GAS AND WATER WORKS.

ESTIMATES FREE

FOR MAIN-LAYING AND GENERAL REPAIRS

RETORT-SETTING A SPÉCIALITÉ.

ROBUS'S IMPROVED RETORT-SETTINGS guaranteed to carbonize a large amount of coal with a small per cent. of fuel.

N.B.—All kinds of Fire Goods, &c., kept in stock for immediate delivery. Orders promptly attended to.

BELL GREEN, CATFORD, S.E.

THE

NITSHILL COMPANY'S

DUKE OF HAMILTON'S

LESMAHAGOW

CANNEL COAL.

AGENT:

JAMES M'KELVIE,

HAYMARKET,

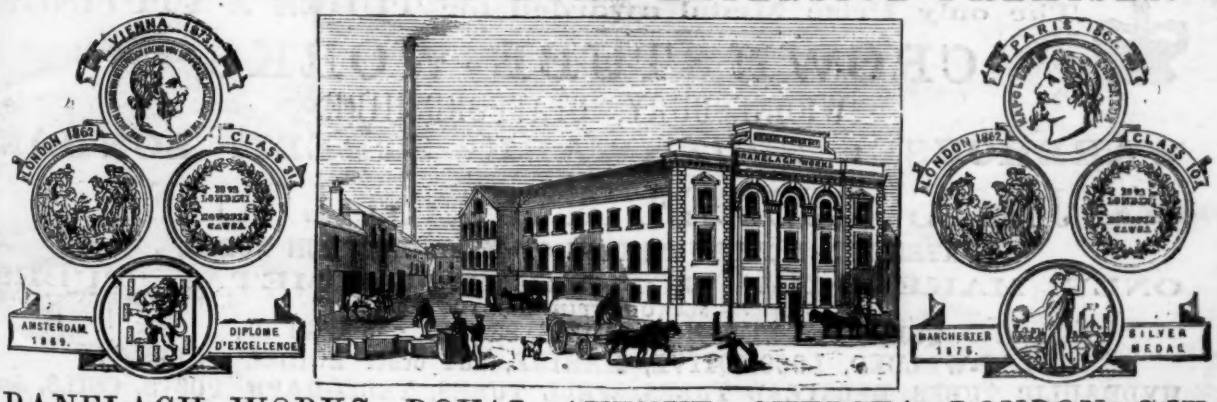
EDINBURGH.

CHANGE OF ADDRESS.

GEORGE GLOVER AND CO.,

DRY GAS-METER MANUFACTURERS,

HAVE REMOVED TO MORE EXTENSIVE PREMISES:



RANELAGH WORKS, ROYAL AVENUE, CHELSEA, LONDON, S.W.

SILVER MEDAL, PARIS EXHIBITION, 1867.

LLOYD AND LLOYD,

ALBION TUBE-WORKS, BIRMINGHAM,

AND

COOMBS WOOD TUBE-WORKS, HALESOWEN,

MANUFACTURERS OF

WROUGHT-IRON TUBES AND FITTINGS,

AND

LAP-WELDED IRON AND HOMOGENEOUS METAL BOILER TUBES,

UP TO FOUR FEET IN DIAMETER.

London Offices: No. 4, Cloak Lane, Queen Street, E.C.

Warehouses: London, Liverpool, Manchester, and Lille.

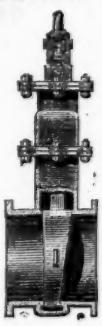
JOSEPH AIRD,

WELLINGTON TUBE-WORKS, TIPTON, STAFFORDSHIRE,

MANUFACTURER OF

EVERY DESCRIPTION OF TUBING, GAS, STEAM, HYDRAULIC TUBES AND FITTINGS,
EITHER BLACK, GALVANIZED, OR ENAMELLED HOT WATER TUBES AND FITTINGS,
CORE BARS, COILS, COCKS (IRON OR BRASS),
CHANDELIERS, &c., GAS-FITTERS' TOOLS, GAS TONGS, STOCKS, TAPS, DIES, &c., &c.,
HANDRAIL TUBINGS, IRON AND BRASS, PLAIN OR TWISTED,
TELEGRAPH TUBES OR POLES, &c., &c.

C. & W. WALKERS' DOUBLE-FACED GAS-VALVES.



These solidly constructed double-faced Gas-Valves have taken the place of the old system of the light, single-faced disc, which is too uncertain and unreliable in large bores.

They are guaranteed absolutely gas-tight. They are very massive and rigid, and by improved modes of manufacture they are produced at very little excess in cost over the old light, weak system, which is liable to spring and bend, and become leaky.

The Valve is a rigid wedge of solid cast iron, having two perfectly scraped surfaced facings fitting between the two on the body, which are also surfaced.

A spring in two short halves, and, therefore, not liable to break, is used only for scraping the front facing clean.

The front facing is vertical; the back facing forms the wedge.

At a slight additional expense both flanges are faced to bolt to main-pipes.

MIDLAND IRON-WORKS,

DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

ROBT. DEMPSTER & SONS,

GAS ENGINEERS, IRONFOUNDERS, AND CONTRACTORS,

ROSE MOUNT IRON-WORKS, ELLAND, YORKSHIRE.

MANUFACTURERS OF EVERY DESCRIPTION OF

GAS APPARATUS;

CONTRACTORS FOR THE

ERECTION OF PUBLIC AND PRIVATE GAS-WORKS.

Plans and Specifications Prepared, and Illustrated Catalogues forwarded on application.

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THE MEDAL FOR 1862.

The only Prize Medal awarded for TUBES & FITTINGS.

CROWN TUBE-WORKS,

WEDNESBURY, STAFFORDSHIRE.

WAREHOUSE: SOUTHWARK STREET, LONDON.

JAMES RUSSELL & SONS, LIMITED,

PATENTEES & FIRST MAKERS OF WROUGHT-IRON TUBES,

ONLY MAKERS OF HOMOGENEOUS METAL TUBES.

MANUFACTURERS OF

TUBES and FITTINGS for GAS, STEAM, and WATER;
LAP-WELDED, LOCOMOTIVE, MARINE, and other BOILER TUBES;
HYDRAULIC TUBES, BEDSTEAD TUBES, WELL TUBES, TELEGRAPH POSTS, COILS, &c.;
GAS-FITTERS TOOLS, VALVES, COCKS, &c.

THOMAS PIGGOTT & CO.,

(Established 1822,)

SPRING HILL, BIRMINGHAM.

MANUFACTURERS OF

TELESCOPIC & SINGLE GASHOLDERS,

CAST & WROUGHT IRON TANKS FOR DITTO;

PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

Drawings, Specifications, and Estimates supplied on application.

RICH. H. TAUNTON & HAYWARD,

MANUFACTURERS OF

WROUGHT-IRON GAS, WATER, & STEAM TUBES & FITTINGS,

STAR TUBE WORKS, HENEAGE STREET, BIRMINGHAM.

HYDRATED PURIFYING MATERIAL.

Samples on application.

MESSRS. SPENCE BROS., LIMITED,

Will be glad to supply the above on the most favourable terms, and to treat, by Purchase or Exchange, for Spent Oxide.

PRICES ON APPLICATION.

ALSO PATENT DRY COPPERAS FOR EXTRACTING AMMONIA.

VICTORIA CHEMICAL WORKS, BRADFORD, NEAR MANCHESTER.

SULPHATE AMMONIA.

R. W. WALLACE & CO.,

60, MARK LANE, LONDON, E.C.,

Are Buyers of SULPHATE AMMONIA in Large or Small Quantities, or Sell on Commission for Gas Companies and Makers.

PLANT ERECTED ON THE LATEST AND MOST APPROVED PRINCIPLE.

AGENTS to THE GASLIGHT AND COKE COMPANY, LONDON, for the SALE of SULPHATE AMMONIA. Works: BECKTON.

Established

1795.

JOSEPH CLIFF & SONS,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

London Wharf: No. 4, inside Great Northern Goods Station, King's Cross, N.;

LIVERPOOL: Back Leeds Street.

SPECIAL NOTICE.—Our Patent Machine-made Retorts have now been in *actual work* nearly 1000 days, and are yet in good order. References on application.

July 2, 1877.

GAS PURIFICATION

BY

OXIDE OF IRON.

GAS PURIFICATION & CHEMICAL Co., LIMITED,

PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.

JOHN WM. O'NEILL, Managing Director.

THE AMERICAN GAS-LIGHT JOURNAL.

A. M. CALLENDER & CO., Proprietors. **G. WARREN DRESSER, Editor.**

Issued Semi-Monthly at No. 42 Pine Street, New York City.

This Journal is especially devoted to Gas Engineering and Manufacture, and is the official organ of the AMERICAN GAS-LIGHT ASSOCIATION, and the NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

Subscriptions at $3.50 per annum, post paid, to Great Britain, may be made direct by forwarding Post Office Money Order or Draft to the above address. Rates of advertisement, $2.00 an inch. Special rates for larger spaces.

WELLS, BIRCH, RYDE, and CO., Limited,

HOYLAND SILKSTONE COLLIERIES,

Near BARNSLEY.

This Company is now in a position to raise **2000 tons per day of REAL OLD SILKSTONE GAS COAL.**

"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

Prices quoted to any Railway Station, or F.O.B. Hull, Grimsby, Goole, Keadby, Liverpool, and Fleetwood.

Full particulars will be sent on application to above address.

THE

STANDARD WASHER AND SCRUBBER.

[KIRKHAM, HULETT, AND CHANDLER'S PATENT.]

Some of the advantages claimed for this Apparatus are as follow:—

The Exposing of a large Amount of Effectually-wetted Surface (which is continually reproduced) to act upon the Gas.
Unerring Regularity in the Distribution of the Liquor.
Saving of Expense in Providing and Exchanging Scrubbing Material—none being required.
Economy of Space, thus enabling the Apparatus to be protected from the Weather.
Economy of First Cost and of Maintenance.
It works without Pressure.
It is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured.

Applications for Prices, &c., to be made to

Messrs. KIRKHAM & HERSEY, GAS ENGINEERS, 21, ABINGDON STREET, WESTMINSTER.

GAS PURIFICATION

BY

OXIDE OF IRON.

COOKE BROTHERS

Beg to draw the attention of Gas Companies to the following certificate, relative to the quantity and quality of their Oxide, from the Assistant Surveyor of the County of Donegal:—

"*Londonderry, Oct.* 12, 1878.

"I have examined some of the deposits of iron ore in the following localities in the county of Donegal, over which Messrs. Cooke Brothers hold exclusive royalties for raising the ore—namely, several townlands in the Barony of Kilmacrenan, including the estate of Viscount Southwell, in the Barony of Raphoe, the estates of Sir Samuel Hayes and Colonel Montgomery, in the Barony of Ennishowen, several townlands on the estate of Mr. Newton—and I certify that the several estates are rich in Oxide; that the ore is of a very good quality, such as is usually shipped from this county; that the districts, which are very extensive, are capable of producing a large supply; in fact, the supply of ore on these estates is practically inexhaustible.

(Signed) "PHILIP M'LAUGHLIN, *Assistant County Surveyor.*"

COOKE BROTHERS beg to state they are also in possession of several other exclusive sources of supply, independent of those included in the above certificate.

26, 27, *and* 28, *Fenchurch Street, London, E.C., Oct.*, 1878.

GEORGE ORME & CO.,

ATLAS METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET AND DRY GAS-METERS,

STATION-METERS, GOVERNORS,

PRESSURE AND EXHAUST REGISTERS,

LAMP-METERS IN CAST-IRON BOXES,

And every Description of Gas Apparatus.

J. T. B. PORTER & CO.,

GAS ENGINEERS & MANUFACTURERS,

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GOWTS BRIDGE WORKS,

LINCOLN.

LONDON OFFICES: 1, WESTMINSTER CHAMBERS, S.W.

ESTIMATES FOR GAS-WORKS OF ANY SIZE.

REFERENCES TO 500 WORKS ALREADY ERECTED.

N.B.—All Communications to be addressed to the FIRM ONLY.

J. & J. BRADDOCK,

GAS ENGINEERS,

GLOBE METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET & DRY CONSUMERS GAS-METERS,

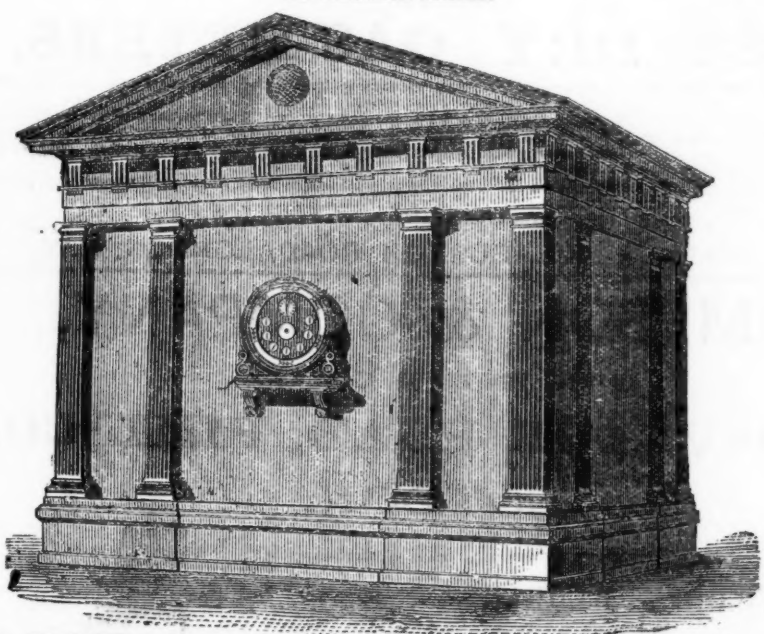
OF THE HIGHEST EXCELLENCE ONLY;

ALSO LICENSEES AND MANUFACTURERS OF

WARNER & COWAN'S PATENT SELF-REGULATING GAS-METERS;

ROUND STATION-METERS,

ON CAST-IRON STANDS.



SQUARE STATION-METERS,

WITH PLANED JOINTS.

GOVERNORS, GAUGES, INDICATORS, MAIN COCKS, &c.

GAS COOKING APPARATUS.

Home and Foreign Orders promptly attended to.

All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.

Orders almost invariably despatched on the day of receipt.

TERMS, &c. ON APPLICATION.

C. & W. WALKER'S

WOOD PURIFIER SIEVES,

Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS,

DONNINGTON, NEAR NEWPORT, SHROPSHIRE.

FINSBURY CIRCUS, LONDON.

ESTABLISHED IN 1860.

BENJAMIN CARPENTER,

THE ORIGINAL MANUFACTURER OF THE IMPROVED

WOOD SIEVES

FOR

GAS PURIFIERS & SCRUBBERS.

PROVIDENCE WORKS,

22, HERMES STREET, PENTONVILLE ROAD

LONDON, N.

DEMPSTER & SONS'

RENOWNED

WOOD SIEVES,

WITH TAPER BARS,

MADE BY MACHINERY

CAPABLE OF MAKING 10,000 FEET WEEKLY.

References to Hundreds of First-Class Engineers.

ROSE MOUNT IRON-WORKS,

ELLAND, NEAR HALIFAX.

JOHN ROMANS, C.E., F.G.S.E.,

CONSULTING GAS ENGINEER

AND

CANNEL COAL FACTOR,

30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

GRIRDROD'S PATENT

PORTABLE PIPE SCREWING MACHINE,

For 1 in., 1¼ in., 1½ in., and 2 in. Gas Threads, complete £7 10s.

In use at the chief gas-works, and giving great satisfaction.

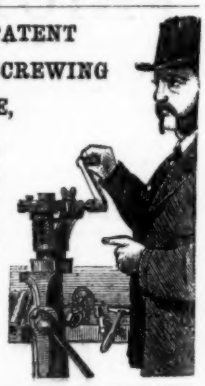
For other useful goods, see Bailey's "Illustrated Inventions," post free 3s. 6d.; gratis to ledger customers.

W. H. BAILEY & CO.,

Brassfounders, Gauge Injector and Tool Makers,

ALBION WORKS, SALFORD,

LANCASHIRE.



THOMAS TURTON AND SONS,

SHEAF AND SPRING WORKS,

SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS,

STEEL OF ALL DESCRIPTIONS,

SCREW STOCKS, TAPS, AND DIES, SPANNERS

RATCHET BRACES, LIFTING-JACKS,

ANVILS, VICES,

AND ENGINEERS TOOLS GENERALLY

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90. CANNON STREET, E.C.

R. W. WINFIELD AND CO.,

CAMBRIDGE STREET WORKS AND ROLLING MILLS,

BIRMINGHAM.

The following Medals have been awarded:—

GRAND COUNCIL MEDAL, LONDON, 1851. | MEDAL, LONDON, 1862.

GOLD MEDAL, PARIS, 1867,

The only Gold Medal awarded for "Apparatus and Processes for Heating and Lighting" by the Imperial Commissioners

MEDAL FOR PROGRESS, VIENNA, 1873.

MANUFACTURERS OF BRASS AND COPPER SHEETS,

TUBE AND WIRE,

ROLLED METALS, LOCOMOTIVE AND CONDENSER TUBES, CYLINDERS;

Ornamental, Taper, and Cased Tubes;

TIN TUBES;

GAS-FITTINGS, CHANDELIERS,

BRACKETS FOR HEATING AND LIGHTING;

METALLIC BEDSTEADS.

Ecclesiastical and Mediæval Metal Workers.

GENERAL BRASSFOUNDERS.

REGISTERED TRADE MARK:

LONDON OFFICES & SHOW-ROOMS: R. W. W. & CO. 141, FLEET STREET, E.C.

EDWARD E. CROMBIE & CO.,

INVENTORS AND PATENTEES

OF THE

FRICTIONLESS DRY GAS-METERS,

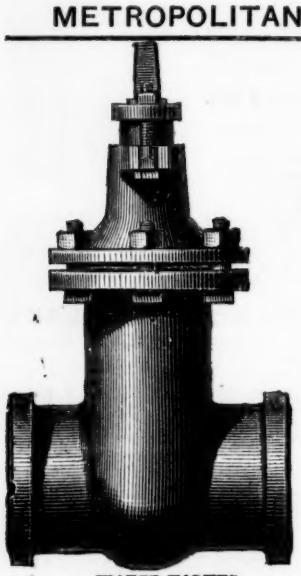
Beg to intimate to Gas Companies and others that they are now prepared to supply these very superior Meters at the same prices as for the ordinary Gas-Meters.

In the construction of this Meter, for which the best tin plates only are used, every mechanical contrivance has been taken advantage of successfully to reduce the friction to a minimum, which is amply proved by the fact that they are made to work upon only one-fortieth of an inch pressure. By an improvement also in their construction, a steadier light is obtained, and greater capacity than can be got from any other Meter in the market. No gas can pass under the valves on any back pressure, as is the case with many other Dry Meters.

To Gas Companies supplying gas through streets with heavy gradients, these Meters are invaluable, as much gas is saved from the low pressure required to work them.

ALL METERS ARE UPHELD FOR FIVE YEARS.

METROPOLITAN WORKS, DIANA PLACE, EUSTON ROAD, LONDON, N.W.



WATER-VALVES.
All Sizes, Flange and Socket, kept in Stock, tested to 1000 feet head.

SIMPSON & COMPANY,

ENGINE-WORKS,

GROSVENOR ROAD, PIMLICO,

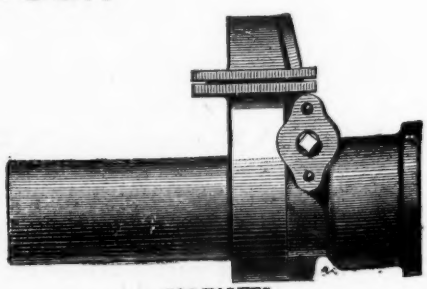
LONDON.

SCREW-COCKS, HYDRANTS,

SLUICES, PENSTOCKS,

And all other Machinery for

WORKS OF WATER SUPPLY, DRAINAGE AND IRRIGATION.



GAS-VALVES.
All Sizes, Flange and Socket, kept in Stock, tested to 100 feet head.

TANGYE BROTHERS AND HOLMAN,

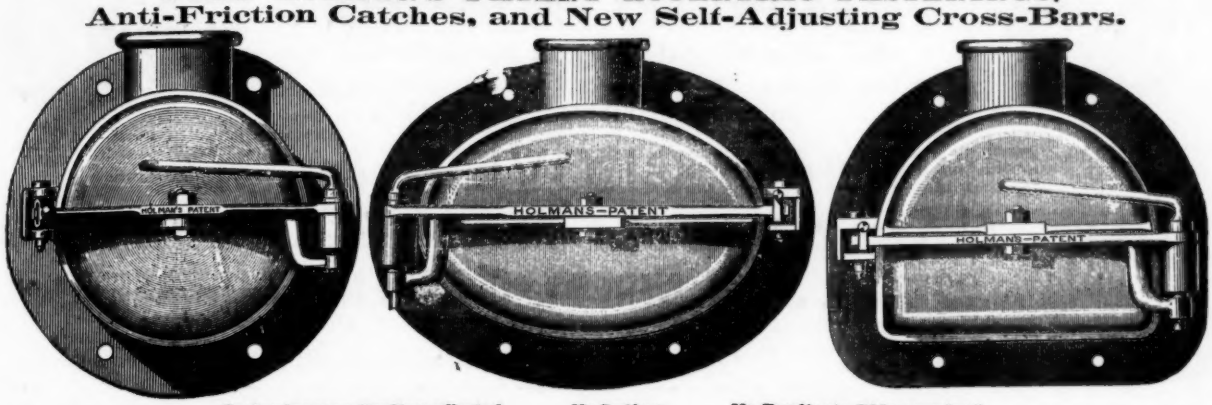
CORNWALL HOUSE, 35, VICTORIA ST., LONDON, E.C.

(LATE OF 10, LAURENCE POUNTNEY LANE.)

SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,

Anti-Friction Catches, and New Self-Adjusting Cross-Bars.



Instantaneous Sealing effected. No Luting. No Duplicate Lids required.

Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested, being now in use in nearly all the principal Gas-Works in London and the Provinces.

T. B. and H. are now making the "Morton's Self-Sealing Lid" of the SAME FORM OR SECTION AS THE RETORT (see Illustrations above), as well as bringing the Mouthpiece from the D or Oval at back to Circular in front, as heretofore.

D and Oval Morton's Lids are working satisfactorily both in this country, on the Continent, and in the United States of America. Among others they have been adopted by the following Gas-Works:—

The Gaslight Company's Works, Fulham; Ditto, Bromley-by-Bow; Ditto, King's Cross; Ditto, Shoreditch.
And also in the Gas-Works at Richmond, Maidstone, Gloucester, Glasgow, Portsea, Roubaix (France), The Hague (Holland

HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at an convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.

These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight and Coke Co. (9), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875.

MESSRS. TANGYE BROTHERS AND HOLMAN,

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

Yours truly,

(Signed) JOHN JOHNSON.

PRICES AND FULL PARTICULARS ON APPLICATION.

THE "SPECIAL" STEAM-PUMP.

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons of Water per Hour, Approximate.	Reduced Prices.
3	1½	9	450	£16
4	2	9	815	18
5*	2½	12	1,250*	20
5*	3	12	1,830*	22 10
4	4	12	3,250	25
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7*	5	12	5,070*	40
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8*	6	12	7,330*	50
7	7	12	9,750	50
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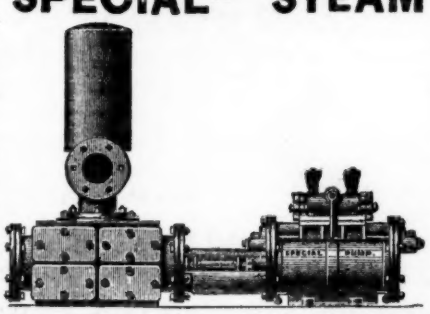

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London, 1851 New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865.

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Paris, 1867.

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3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
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Are upheld for five years without charge.

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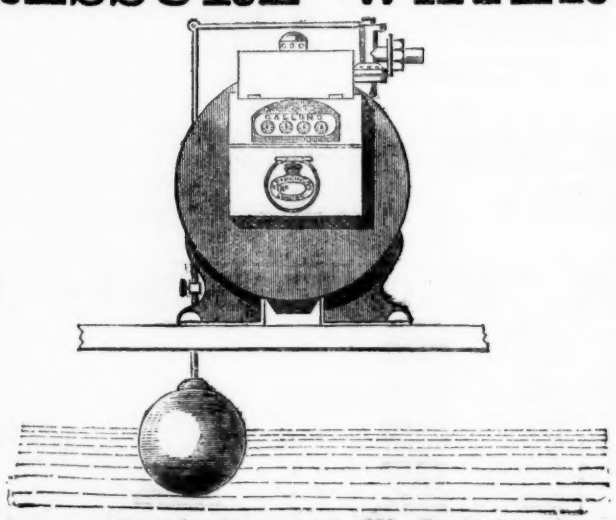
The 100-gallon Meter is fitted with a cistern holding about three or four gallons, and may be fixed inside a house, free from the effects of frost, and requires no attention after once being fixed.



From "The Engineer," April 6, 1877.

"Low-pressure Meters have been found to register with almost perfect accuracy, or, at all events, within 5 per cent. either for or against the consumer, and from the nature of their construction are by no means easily deranged. Still, even the low-pressure meters have their disadvantages, but these are chiefly as respects the question of first cost, seeing that they must have a cistern fixed at a higher level than that at which the supply is needed. All things considered, however, the balance of opinion rules at present in favour of the low-pressure Meter, and they are consequently increasing in favour as time goes on."

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NOTTINGHAM, DERBY, LEICESTER, SUNDERLAND, GREAT YARMOUTH, SHEFFIELD, NORWICH, LOWESTOFT, COVENTRY, SOUTHEND.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 15, 1878.

DEATH OF MR. WILLIAM B. KING.

It is with the utmost regret that we announce the decease of Mr. William Boughton King, so many years connected with the management of this Journal, and, since the death of Mr. Barlow, its Editor.

Mr. King joined the profession of journalism in early life, and soon became known as one of the most expert reporters on the London press. To his skill the columns of the Journal have borne abundant testimony. We may particularly refer to the report of the parliamentary proceedings in connection of the Metropolis Gas Act of 1860, the notes for which were all taken by Mr. King's own hand. We may mention here also that the reports of all the meetings of the British Association of Gas Managers, except the last, were written by Mr. King. His familiar face will long be missed at subsequent meetings of the Association, as well as at the half-yearly gatherings of the Metropolitan Gas Companies.

His talent as a reporter brought him into contact with the late Mr. Barlow, and he became the Publisher of the Journal in 1856. Subsequently, he took a more considerable part in the management, and, as we have said, became Editor in 1872.

The weekly issue of the Journal and the publication of the "Treatise on the Science and Practice of the Manufac- "ture and Distribution of Coal Gas" were solely due to his enterprise, and the latter work will, we anticipate, carry down his name to many generations of future Gas Managers.

Mr. King's knowledge of gas affairs was unrivalled. He knew the history of almost every company, and his advice was often sought when parliamentary proceedings were pending.

A kind-hearted and generous man, he was highly esteemed by every one who knew him, and his loss will be deeply felt. His death may be said to have been premature, for he was only in his fifty-eighth year; but a life of hard work had told upon a constitution never strong, and he succumbed to heart disease on the 9th inst., after an illness of more than three months.

Circular to Gas Companies.

In consequence of a report from America that Mr. Edison had succeeded in minutely dividing an electric current so as to produce a multiplicity of lights from one machine, a veritable panic set in amongst Gas Shareholders, and during the past week prices have fallen to an alarming extent. We have more than once intimated our opinion that a strong electric current could be subdivided; in fact, any one who examines the machines at present in use, and sees five conductors passing from the collector, must know, at a moment's glance, that if five can be put in use, it is simply a question of arrangement whether fifty might not be put in their place. What Mr. Edison has discovered we do not at present know. He is beyond doubt an extraordinary genius. He has invented a number of very clever scientific toys; whether the telephone, the microphone, &c., will ever become more than toys, remains to be seen. What we are here concerned with is the division of the electric current, which is supposed to make electricity applicable to domestic illumination. Without believing in the subdivision, we may just ask what has been accomplished? Electricity, at what cost we know not, has been conveyed into a house and distributed into every apartment. But what then? There must be a material to produce the light, and so far as we know at present only carbon points can be used. How are these to be employed in lighting small apartments? It is quite certain they would have to be frequently changed, and the constant substitution of one carbon for another would come to very much the same thing as the use of snuffers for tallow dips. Amongst the more amusing portion of the reports was that which tells us that Mr. Edison has discovered a mode of adapting ordinary gas-fittings to the electric light. Granting that he has succeeded in minutely subdividing the electric current, we can easily imagine that fine wires might convey to the globes of a gaselier a current which might produce light within them; but then comes the difficulty we have mentioned before—the carbon points and their frequent replacement. We have left the most ridiculous part of the rumour to the last. Mr. Edison professes to be able to supply heat as well as light, and asserts that he can apply his invention to heating and cooking machines, as well as illuminating burners. Now, every sane individual knows perfectly well that heat results from combustion, and that the quantity of the heat depends upon the amount of the combustible consumed, and in the electric light a large amount of light is developed by the vivid incandescence of two carbon points, which are really but slowly consumed. The actual amount of heat produced must depend upon the quantity of carbon burnt. The carbon points used at present in the Jablochkoff or Lontin lamps consume, perhaps, an ounce of carbon per hour. Where is the heat to come from? There is one other thing reported, and that is that the electric current is to be used to produce motive force. Thus electricity may be made to generate itself, and so we come round in a circle. When all these wonders are accomplished, the prospects of Gas Shareholders will become dismal; but, at the present moment, we have small belief in the accomplishment of any one of Mr. Edison's electrical predictions. He may add seventy more to his now almost innumerable patents; but we shall wait with perfect confidence the triumph of gas.

Already Shareholders are getting reassured, and prices are rising. After the perusal of the letter by Mr. W. Sugg, which we publish in another column, some further reaction is certain to take place. According to this able experimenter, the electric light is not cheap, and, light for light, cannot compete with gas. We do not make much of this, because there may be circumstances under which a more expensive light might be used with advantage. The electric light at the present moment constitutes a splendid advertisement, and it may be, although we do not think it likely, that Mr. Hollingshead profits by his display at the Gaiety. And here we may mention that two new exhibitions of the light have appeared in London. A large lamp has been placed over the window of the Stereoscopic Company in Regent Street, where the advantages and defects of the light for street illumination are well seen. The observer

stands under a flood of light which magnificently illuminates the shop window, but on casting his eyes up and down the street he looks into thick darkness. It is, to our minds, certain that if the electric light be employed for street illumination the lamps must be placed as near as, or nearer together than the gas-lamps are to-day. This is the case on the Place de l'Opéra, the exhibition of which so dazzles Englishmen. For the interior lighting of large areas, we have always admitted there may be a future for electricity, and we are bound to say that the display made by Messrs. Wells and Sons, of Shoreditch, is very successful. How long it will continue we are, of course, unable to say; but, without fear, we predict a return to gaslight at no distant day. Economic considerations do not always predominate in these matters; but, unless Mr. Sugg be very wrong in his figures, the difference of the cost of the two lights will soon be discovered in a large establishment, and sensible regard to finance will induce the proprietors to return to the cheaper light.

We have said but little respecting the fall in shares. As we write, the panic may be said to be nearly over, and the unfortunate dupes who were frightened into parting with their shares are now deeply regretting their credulity. We have done our best, privately and publicly, to prevent the sacrifice of property, and, we believe, with some success. There is one thing we may add which should give confidence to Shareholders; their property finds a ready sale, which ought to show them that there are people who have still confidence in gas investments. The curious fluctuations which have occurred in the price of shares of different Companies would be perfectly incomprehensible, if it were not supposeable that very few shares of some Companies have been thrown upon the market.

We shall presently be inundated with reports on the electric light. Mr. Bassingham, a member of the City Sewers Commission, has been to Paris and investigated the matter for himself; and the information he has brought home, which is not at all favourable to the prospects of the light, will, we hope, soon be accessible to our readers. Lieut.-Col. Haywood, the Engineer to the Commissioners, has also been to Paris, and he, too, will shortly publish his views. Thus we shall soon have a flood of light upon this luminous business, and Gas Shareholders will be well able to judge to what extent their property is endangered.

The gas accounts of the Corporation of Manchester, which we publish in another column, when we come to study them, afford nothing for further comment. The consumption of gas goes on increasing in Manchester, and necessarily the profits of the Corporation grow along with it. The appropriation of nearly £52,000 of the gas profits to the improvement-fund is noticeable, and we are happy to see it has attracted the attention of gas consumers. We have so frequently urged that the consumers of gas should not be subjected to additional taxation, that nothing need here be said in addition to remarks made on previous occasions. What if the electric light blazes out in Manchester? The Corporation, it is true, have a complete monopoly, at all events, of public lighting; but as much may be done in Manchester as has been done at Rouen and other French cities, and mills and foundries may be illuminated by the new light. It is quite time that gas was cheaper in Manchester, and, if the electric light scares the Gas Committee and Corporation into a reconsideration of the principles on which they conduct their undertaking, some good will have been accomplished.

Mr. Arthur Silverthorne has once more interrogated Mr. Gladstone as to his views regarding the supply of gas by Local Authorities. The answer of the right honourable gentleman is somewhat vague, and not encouraging to his interrogator. We are perfectly certain that a sound financier like Mr. Gladstone would not impose a tax in disguise upon gas consumers; and the object of Mr. Silverthorne is to persuade Corporations to confiscate gas undertakings, in order that they may appropriate the profits to what is called the relief of rates. Mr. Gladstone, we are perfectly certain, will not, when the issue is plainly put before him, assist in this enterprise.

There is nothing which calls for much further notice in the report of the half-yearly meeting of the South Metropolitan Gas Company which we publish to-day. We learn with regret that the negotiations for amalgamation have fallen through, and the *mot d'ordre* is, "As you were." We are not at all surprised at this, for the difficulties in bringing together Companies, whose prospects are very different, must be apparent to every one. But still we sometimes look for public spirit in men in responsible positions; and when it is considered how great would be the advantages of a general combination among the London Gas Companies, we are rather astonished to see one of the smallest stand out from so desirable a union.

The half-yearly ordinary meeting of the Swansea Company was held last week, when, as usual, full statutory dividends were declared, and a fair balance carried to the reserve-fund. The Company are one of the most persecuted in the United Kingdom, and recently a gross attack has been made, which deserves some notice. There is what is called a "Ratepayers Association" in the town, which probably consists of a few frequenters of some small pot-house. They have, however, made a report, no doubt with the assistance of what is known in the press as a "para-"graphist." The ratepayers in question probably know little about gas; but if they read their papers, they would know that the statement they start with is a gross untruth. It is quite true that the Swansea Gas Act imposes upon the Company the obligation to supply only eleven-candle gas; but the reports of the Gas Examiner, regularly published, show that the gas actually supplied has rarely been less than the illuminating power of fourteen candles, and is often above that quality.

The undertaking of the Bury St. Edmund's Gas Company is likely soon to pass into the hands of the Corporation of that borough. The Company are about to apply to Parliament for further powers, and the Corporation will take the opportunity of obtaining a purchase clause in the Bill. An Alderman of the borough, who is also a Director of the Company, intimates his belief that the purchase will not be opposed if it can be shown that the town will be benefited. We have never known a town benefited by the transfer of a gas undertaking to a Local Authority; but the people of Bury St. Edmund's must make up their minds for themselves.

The Corporation of Barrow-in-Furness are inclined to be economical. Their Gas and Water Manager has resigned, and so has their Borough Surveyor. It now occurs to the thrifty Council to combine the two, it might be said the three, officers, into one person, and so save a hundred or two a year. The combination is a peculiar one, and although many men might be found quite equal to the performance of the duties, we question whether the Barrow-in-Furness Corporation will succeed in securing the services of the best of them.

Dr. Barclay, the Gas Examiner for Chelsea, has been testing the London Company's gas with Sugg's Argand Burner, and finds, as we knew he would, its illuminating power equal to sixteen candles. He regards his own return as misleading, for he thinks the gas ought not to be tested by the "London" burner. The Company are only bound to supply twelve-candle gas, and the Vestry, instead of grumbling, ought to be grateful for getting a higher quality. Surely it is better to use a burner that affords light, rather than one that destroys it.

We publish in another column the able address of Mr. Hepworth, the President of the North of England Gas Managers Association, as well as the papers read at the recent meeting, but want of space prevents us from noticing them this week.

Water and Sanitary Notes.

THE attention of the Metropolitan Board of Works has been called to the state of the Thames, near the sewage outfalls, by the Sanitary Committee of the City of London, in consequence of a report from the Medical Officer of the Port of London, who seems to believe that the present condition of the river is detrimental to health. We do not know of any special cases of sickness having occurred, although it is alleged that fever has been prevalent at Woolwich, which town, however, has never been a particularly healthy place. The Board will have some difficulty in quieting the outcry which has arisen, and may, in time, be driven to take some steps for the purification of the sewage. We notice the suggestion of one Member of the Board—that the sewage should be filtered, and only the liquid part sent into the river. The filtration of such an enormous quantity would involve an immense expense, and prove an intolerable nuisance. When it is remembered that the collected supply of all the Metropolitan Water Companies flows through the sewers, some idea may be gained of the extent of the filter-beds which would be required, and the cost of the land and works necessary for them. Beyond all doubt, if any change be made, it must be to take the sewage farther down the river, but the expense of doing this would be very great, and the result might not be altogether satisfactory. It would, however, be infinitely preferable to the adoption of any scheme of purification by treatment with chemicals or by filtration.

It may be doubtful how far the Metropolitan Board will be supported by the Vestries in their fresh attempt to buy up the Water Companies. We have at present no precise information as to whether or not it is intended to bring forward again the Bill to empower the Board to furnish a dual supply. It may be imagined, however, the two Bills will be promoted much in the same form they were presented to Parliament last session. The

cost of promoting these Bills has not yet been made public; but we see that Mr. Watkin, of the St. Pancras Vestry, estimates the expense at £20,000. This, it is true, is not a large sum, when the resources of the Board are considered. Still it must tell on Metropolitan rates. St. Pancras are the only Vestry who have as yet moved in the matter, and the support they are likely to give the Board is not doubtful.

There may be great honour in being a Member of the Board; but it must be confessed that the labours are very onerous. The Works Committee must be overwhelmed with work. They have, at present, eleven schemes on hand under the Artisans Dwellings Act, 1875, and have now three more forced upon them. The operations under this Act necessarily proceed very slowly, and some people go so far as to assert that at present it is doing more harm than good. Certainly the demolition of the wretched hovels in which the poor have been sheltered must cause temporary inconvenience; and additional agency for rapid reconstruction is evidently necessary, but does not seem to be forthcoming. We fear we shall have to wait several years before the good effects of the Act are made apparent.

We are glad to see that the water of the Southwark and Vauxhall Company supplied to Wandsworth is better reported upon. Sufficient credit has never been given to this Company for the strenuous exertions they have made, under many difficulties, to improve the character of their water. They are now fast getting over their misfortunes, and the supply for the future is likely to be all that can be desired.

The unlucky Beddington Sewage Farm of the Croydon Local Board is once more let, now at a rental of £2000. The average annual loss made by the Board since they have worked the farm has been £2871, and the loss which is likely to accrue under the present arrangement, it is said, will amount to £2505. Croydon gets rid of its sewage, it is true, and for this the ratepayers must pay; and, further, they are not now persecuted for polluting the Wandle; but the history of this farm shows how fallacious have been the hopes of the projectors of sewage farming. The Croydon Board, however, do not stand alone. Their experience agrees pretty closely with that of most of the other Local Authorities who have adopted the system.

An agreement has been come to between the Cardiff Corporation and the Water Company for the transfer of the undertaking of the latter, in consideration of the payment of £300,000, either in a lump sum or by way of annuities. According to the Cardiff Water-Works Act, which we recently noticed, the expended capital of the Company amounts to £116,490, and there is besides a loan debt of £221,550. This latter is, of course, assumed by the Corporation. The purchase is in every respect a good one for the Company, the price about to be paid being, we rather think, one of the highest ever settled for a Water Company by agreement.

A scheme for the drainage of the valley of the Exe has been devised by Messrs. Hassard and Tyrell. They propose to commence at Tiverton, and carry a sewer twenty-six miles long to Straight Point, picking up on the way the sewage of all the towns and villages which now flows into the Exe. Thus the waters of that river will be rendered pure and fit to furnish a supply to Exeter, while the towns below the city, and the Earl of Devon, will no longer be able to complain of nuisance. The scheme on paper looks excellent, and it is estimated to cost only £200,000. A Bill must necessarily be presented to Parliament to constitute a Board for the drainage of the valley of the Exe, and if that be passed, the towns which share the advantages of the operations will have to bear a proportionate amount of the cost. The Town Council of Exeter have not yet adopted the scheme, but, so far as we can see, it looks to us simple and perfect.

How best to ventilate sewers has been recently discussed by Mr. Mansergh in connection with the sewerage of Plymouth. There is really but one thing to be done, and that is to make as many free openings to the air as possible; but some of the streets in Plymouth are very narrow, and in these it is proposed to place charcoal boxes over the ventilators. We are not aware that these do the slightest good, and, for our own part, simply advocate the freest access of sewer gas to the open air. It has yet to be proved that the solid germs of disease rise with the gases, and without solid germs the doctors assure us that disease cannot be propagated.

Newbury Gas-Works.—With the commencement of the present month, the management of these gas-works passed from the Company to the Corporation, and, although the valuable services of Mr. J. H. Mason, the Chairman of the Company, will no longer be devoted to the undertaking, it is satisfactory to know that the Gas Committee of the Council will be presided over by a Director of the late Company, Alderman Jackson, and further, that Mr. J. G. O'Farrell will be retained as Manager. The details of the arrangement under which the transfer has taken place will be shortly known.—*Reading Mercury.*

Correspondence.

[*We do not hold ourselves responsible for the opinions expressed by Correspondents.*]

THE EDUCATION OF THE GAS MANAGER OF THE FUTURE.

Sir,—Your invitation to contribute to the discussion in your columns, on the above subject, prompts me to offer a suggestion which has long been dormant in my mind, but which has been roused by the timely letter of "Isca," in your Journal of the 17th ult.

And first, let me observe, with regard to "Isca's" proposal, that I think many—especially those fortunate in the matter of testimonials and references — would hardly care to submit to the competitive examination indicated. Students, &c., fresh from college or the drawing office, would, no doubt, eagerly embrace the opportunity, as being an easy ladder to fame, while more matured managers, probably with equal training and far greater experience, would hold aloof, simply because they had forgotten the atomic weights of some of the elements, or had become rusty in their views of electrical induction or the diffraction of light.

Again, "Isca" suggests that "standard authorities should be specified," &c. Now, I venture to hope the Association will not treat managers as so many schoolboys. Surely a man who takes up a science, with a view of using it professionally, will not be so far removed from civilization as to be unable to consult those whose special business it is to teach and advise on such matters. At all events, if he is, I am afraid there will be very little scope for the exercise of his scientific attainments.

Mr. Warner's idea is a good one, so far as the tone of the Association is concerned, but of comparatively little use to the members individually, unless directors can be persuaded to elect their managers from the higher in preference to the lower class, instead of accepting the lowest tender as to salary, now so frequently the case.

Mr. M'Crae's proposal for the extension of the annual meeting of the Association for the purpose of competitive examination would be useless to those who would be most desirous of competing—viz., assistants and sub-managers, whose duties would be at the works in the absence of their chiefs, but who are themselves aspiring to become managers of works.

I would suggest rather that the Association should offer a subject each year, upon which papers might be sent in (of course, under seal and motto), and that certificates of proficiency be granted to those whose papers were thought worthy by the examiners—the best being rewarded by a medal, which should be looked upon as the greatest honour the Association could bestow. The subject chosen should be upon some matter requiring scientific knowledge, and should, moreover, be sufficiently technical to preclude the papers being mere compilations from text-books. The details of the scheme would, of course, be worked out by a Committee of the Association; but I would suggest, as a further inducement to members to send in papers, that the successful competitors be announced at the annual meeting, that the prize papers be printed in the report of proceedings for the current year, and that a distinguishing mark be attached to the names of medallists in the lists of members.

I think the above scheme would do much to promote the education of the Gas Manager of the Future. Besides affording an incentive to members to brush up their knowledge of scientific subjects, it would act as a stimulus to research in many matters of our profession not generally understood, but upon which it is desirable to acquire further information.

It is hardly necessary to add that the establishment of a prize essay need in no way interfere with the premiums for papers at present bestowed by the Association.

Oct. 4, 1878. Sub-Manager.

Sir,—I rarely trouble your columns in the way of letter-writing; but as the above question seems to have been introduced, as it appears to me, with the object of disparaging the class of managers designated the "Frugal Stoker," and as I have had considerable experience both of that class and the class which I remember hearing styled, in contradistinction, by a respected mayor of a large provincial town, and chairman of the gas company, the "Goose-quill Engineer," it strikes me that, out of respect to the class whence I sprang—viz., the "Frugal Stoker," or very nearly so—I feel called upon to vindicate the superiority of my order for all practical purposes, against all the quills and pestle-and-mortar gas managers which I have yet seen or heard of; and few people will be surprised to hear that "Cum Multis Aliis," with all his knowledge of Ovid and other Latin authors, has found out, doubtless to his great mortification, that gas directors and municipal councillors are very much of the same opinion.

It affords one a very unsatisfactory reflection in having somewhat bluntly to criticize a prepared speech or letter from a friend, unless the subject be politics; but really, of late (I mean the last few years), the readers of the Journal—those of us who are practical gas engineers, not goose-quillers—must have been nauseated with the learned (sometimes classical) patronizing airs assumed towards the rank and file of the profession by some top members, whose sole authority, as it appears to me, for so speaking is their money success, and which, not unlikely, they inherited, or because of their extra amount of tact (it might be called by a truer name) in wiring out of "Frugal Stokers" their practical experience, and then trumpeting it forth in evidence before Committees of Parliament as of their own knowledge and experience; hence, finding themselves successful in this branch of *management*, they seem to imagine themselves qualified and called upon to lecture the bone and sinew of the profession as to the knowledge required for the successful management of the works under their care, just as if their gas-works management could be pointed to as immeasurably superior to that of those of us who scarcely know the road to Westminster.

In order to test the question, I would ask any of those University-educated managers, who are believers in this proposed new mode of qualifying gas managers, this question: Let us suppose "Cum Multis Aliis" takes a lease of, say, the Aberdeen Gas-Works, and had to appoint an engineer to manage the works for him. Two men apply. One has

been educated at the Putney College of Engineers, is a fair chemist, can turn out an elaborately finished drawing, and write a most grammatical report. The other had been bred a practical engineer—say in a small country town, where, when a lad, he had to make the gas, lay the mains and services, fix the meters, and do a little repairing; had assisted in erecting the entire apparatus of gas-works; had, from being a working engineer, obtained by competitive election, the management of small gas-works, where he had proved himself qualified for the duties, sometimes himself taking a turn at the shovel, the pickaxe, or the caulking-iron; from there he had been appointed to still larger works, where he did not require to do manual labour, but was quite prepared, if necessary, on an occasion, to take the clinkering-bar, the trowel, the shovel, or the caulking-iron out of the hands of any of his workmen who might attempt to dispute the practicability of his orders. I ask which of these men would our certificated, University-educated gas engineer entrust with the management of his own gas-works at Aberdeen? I guess, as the Yankee would say, who would be my man by a hundred per cent., even though he had never heard of Ovid.

The picture, Mr. Editor, as drawn, is dead true to life, and I know there are many successful engineers in our profession, at this moment, who will endorse every word I have written, and who now, when placed to manage all the multifarious ordinary duties, with the occasional emergencies to which they are subjected, would beat all to sticks the certificated, college-bred gas managers in existence. In fact, the men I allude to are, as a class, so fruitful in resources, especially in emergencies, that your kid-gloved men, compared with them, would be nowhere in the race on a fair field where there was no favour, presuming that commercial results was the object to be won, and not a study how to double up your opponent by bamboozlement, and perhaps something worse than that, before Committees of Parliament. I grant at once, if it is a parliamentary gas engineer who is wanted by the Association, then by all means give him a diplomatic training, teach him how to wire out of the practical manager all his knowledge, without allowing his own ignorance of the questions in hand to be seen. Post him well up in chemical and algebraic terms and signs, so as to be able to flaunt them freely in the hearing of directors and town councillors, who, while having individual misgivings as to the sterling ring of the metal, still each hesitates to express his impressions to his fellows, for fear of appearing illiterate, not classically educated up to the standard of "Cum Multis Aliis."

Men of this class I would propose should be called parliamentary gas advocates, but whom I would never dream of appointing to the management of any gas-works where my stake was heavy.

One word, and I am done. It will be understood that I do not for one moment wish it to be inferred that self-taught and self-made gas managers do not need to improve themselves in their knowledge of the sciences connected with the important branch of manufacture in which they are engaged. No; I fully believe that the men of whom, and for whom I speak will, as a class, be found equally as painstaking experimenters, industrious inquirers after the hidden treasures of nature in the materials on which they operate, as are the generality of your University-trained engineers.

I enclose you my real name. If you prefer it, or if you think the question demands it, or would be benefited by it, you are at liberty to affix it. If not, call me

Oct. 10, 1878. "Once a Millwright."

THE ELECTRIC LIGHT.

Sir,—As great anxiety prevails among Gas Companies (though I think needlessly) respecting the electric light, and numerous applications have been made to me suggesting that, as most of the Companies would not, under their existing statutory powers, be able to supply the electric light, even if it were found desirable, the Companies should unite in promoting a general Bill to get such powers, I shall feel obliged if you will kindly state, in your next publication, that it has been arranged to convene a deputation of the Companies to wait on the Board of Trade, as soon as the Board are ready to receive it; but this probably will not be before the middle of November next.

In the meanwhile, it may relieve the anxiety of some of the Companies to explain that such a Bill would of necessity be a public measure, and could be brought in at any part of the session without notices being published in November, as in the case of private Bills.

W. Livesey, Secretary.

Gas and Water Companies Association, 6, Victoria Street, Westminster, Oct. 14, 1878.

Sir,—Calm and experienced observers of "the world and its ways" must have become convinced of the fact that in the human family there are great varieties as well as considerable numbers of the genus fool; and on reading the gaseous news of the last few days, it has struck me that a new variety of this genus has appeared, which may be denominated the electric fool.

It seems that some of these curious, impulsive, and gullible beings happen to be Shareholders in the Metropolitan Gas Companies, and from the newspapers of the day we find they were willing, a day or two since, to sell the property they held in these sound undertakings at about 33 per cent. less than they could have obtained for it a few weeks since; and if all the present Shareholders were like minded, the total loss on the transfer of the entire stock, at the low rate, would have amounted to four millions sterling on the twelve millions or so invested in these concerns.

Now let us glance at the folly of these people. The property in question is intrinsically worth quite as much to-day as it was yesterday or the day before, or at any time within the last twelve months; nothing has occurred to lead to a suspicion that the profits of the Companies will be less in the future than in the past, and it is a well-established fact that to this day, the prosperity of these undertakings has been an increasing quantity.

But the cause of all the weakness and folly which have been manifested is found in the fact that a scientific genius on the other side of the Atlantic has telegraphed to Paris and London that he has hit upon a method of dividing an electric current, and thus rendering it of greater value by reason of its consequent increased adaptability to the ordinary requirements of artificial lighting; that he has *computed* the cost, and finds it (by *computation*, let it be observed) to be from 46 to 95 times less than the same quantity when produced in the usual way; in other words, it may be stated that, in the new way, as compared with the old, it will cost within 5 per cent. of nothing! and, having arrived at this conclusion, he threatens war with all gas companies, and, in the end, their utter extermination! Let us hope "the end of all (these) things is (*not*) at hand."

In this amiable way he has frightened the holders of stock in the Gas Companies of this Metropolis, and perhaps throughout the United Kingdom, into a belief that gas property is doomed to extinction.

It is to be hoped, however, that this senseless panic may not spread, and that present holders of Metropolitan gas stock may not be deluded into a sacrifice of property, which, to say the least of it, is worth as much as it ever has been. There is in reality no reason for their fears; all the facts at present known being in favour of the conclusion that property invested in gas undertakings is as safe as in any existing industrial concerns.

I have taken pains to make myself acquainted with the electric light, in all its various stages of improvement and progress for the last 30 years, including its recent and present public trials in Paris, more especially as it is applied in the Avenue de l'Opéra, where I have carefully observed it night after night. I have also seen it in practical operation at the railway station at Brussels, and I am entirely satisfied that gas has nothing to fear from it as a rival for general lighting purposes, but, on the contrary, something to gain.

I will not take up your space by stating my views as to its numerous disabilities, such as I conceive are inherent to its nature, because they have already been ably dealt with by Mr. Sugg in his letter to *The Times* of yesterdate; but as regards the possible, and I will even say *probable* gain to gaslight companies by reason of the rivalry of the electric light, I may point out that it may fairly be anticipated that if we, in London, are to become in any sensible degree familiar, as I hope we may be, with electric lighting, we shall perforce be driven into a more liberal use of gas. A moderate amount of artificial light may suffice, in the absence of a greater quantity which disturbs our vision in the next house or street; but if a greater quantity partially prevails, the smaller will inevitably have to be increased to such a degree as will render the difference less disagreeable; and thus let us hope that the niggard pinching and cheese-paring of some of the Metropolitan Vestries, in regard to public lighting, may be put to shame; and the miserable starvation little gas-burners which give just enough light to enable passers-by to see the lamp-post which it surmounts, and so to avoid running against it, may be made to give place to one better fitted to illuminate the darkness of our streets.

In any event, and for many reasons, it is clear to all gas men who have looked well into the matter, that the property invested in gas-works is as safe as it ever was; and that, however much electric lighting may be improved, as no doubt it will be, desirable and invaluable as it undoubtedly is for many purposes, it will never come into active competition with gas for what may be called domestic use.

As regards the idea that has been put forward—that the Gas Companies would do well to take it up, and make it a part of their business—it appears to me that this betokens a want of the commercial and practical element in the minds of the scientific men who put it forth. They are evidently not aware that the powers and authority of all statutory gas companies are strictly defined, and limited to the production and distribution of gas of a clearly-defined illuminating power, within the districts assigned to them, and that before they could apply any capital to the apparatus required for the production of electricity they must obtain powers which only the Imperial Parliament can give. But there will be plenty of time for any gas company to apply for such powers when the inventing geniuses of the present or the next generation may have overcome all the difficult problems yet unsolved in regard to the rough-and-ready application of electricity to the lighting of our homes and offices, the working of hoists, and the cleaning of our knives and forks, &c., &c., as suggested by the gas companies annihilator on the other side of the Atlantic. R. P. Spice.

21, *Parliament Street, Westminster, S.W., Oct.* 12, 1878.

Sir,—At the present moment so much attention has been devoted to this subject, and so many exaggerated and false ideas are propagated, that I think it well to direct the attention of your readers to one very important point in the controversy.

There has been, no doubt, great progress made in the economical production of electricity within the past few years, and the machines of Siemens, Gramme, and others, give a source of electricity of large quantity (but low tension) more economically than any apparatus previously used. Hence it has been argued that improvements are sure to be made, which will still further reduce the cost of the electric current. I propose to deal with this question solely, and to demonstrate that little or no improvement can be made in the economy of the dynamo-electric machine; that is to say, the machine which produces electricity from mechanical force—the most economical source of the current yet discovered. I have submitted my demonstration to men well qualified by their attainments to judge of its cogency, and they agree that the proof is conclusive.

It has for a very long time been known that it is impossible to add or take away one grain from any form of ponderable matter; but it is only within the last quarter of a century that a similar principle has been applied to force, and it is proved that it is impossible to add or diminish, by the smallest unit, its quantity. It is possible to convert one force into another, as it is possible to alter the form and combinations of ponderable matter. For example, an ounce of carbon—a black opaque solid—may burn with oxygen into carbonic oxide, a transparent elastic gas; this again may combine with hydrogen, and become portion of the juices of a plant; the plant may form the food of an animal, and the carbon may thus become part of the animal's structure; and so the carbon may go through numberless combinations, but still the original ounce of carbon remains, neither increased nor diminished in weight to the extent of a single grain. In the same manner, if we

burn an ounce of carbon under a steam-boiler, its chemical combination with oxygen produces heat; this heat, by the steam-engine, is converted into mechanical force; the mechanical force, by the dynamo-electric machine, is converted into electricity; the electricity, in the electric lamp, is converted into light; and thus one force is always produced by the expenditure of another. Force cannot be created, force cannot be destroyed, any more than can any chemical element. As the particle of carbon was now an inert solid, now an elastic gas, now formed part of a plant, now built up the structure of an animal, so force now appears as chemical affinity, now as heat, light, magnetism, electricity, or motive power. This principle, which is called "the conservation of energy," unites in one connected whole the forces of nature, and by the union illustrates the system on which they all depend, and strengthens the proof of the harmonious laws by which they all are controlled. I look on this principle, built up by the labours of the greatest mathematicians and the ablest experimenters — Carnot, Clausius, Sir W. Thompson, Grove, and Joule—as the greatest accession to science that the nineteenth century can reckon.

Now, although, as I have said, energy cannot be *destroyed*, yet when we try to utilize it practically much of it is *dissipated;* and this subject has been ably treated by Sir William Thompson, in his writings on "The Dissipation of Energy." Without entering on the large field which he has occupied, I will confine myself to the simple practical statement that, whenever man contrives to convert one form of force into another, a portion of energy is dissipated, escapes beyond the reach of his apparatus, and cannot be utilized. A notable instance of this occurs in the steam-engine. Two pounds of carbon, in burning, generate 28,000 units of heat, and each unit of heat should generate, 780 foot pounds of mechanical force. Now, 28,000 × 780 = 21,840,000 foot pounds, or say, in round numbers, 22 millions of foot pounds, while 1-horse power for one hour is equal to only 2 millions of foot pounds. Therefore, 2 lbs. of coal should give 11-horse power for an hour, if none of the energy were dissipated. In fact, with the most economical engines and boilers, 2 lbs. of coal per hour give only for one hour 1 indicated horse power, or 9 per cent. of the theoretical maximum. Again, the indicated horse power only measures the force acting on the piston. If the force were measured on the main shaft, after the rectilineal had been converted into circular motion, a loss of about one-fourth would be discovered, so that a rotary steam-engine delivers, say, 7 per cent., or 1-14th of the energy produced by the combustion of the fuel; the rest of the energy having been dissipated. I speak of the best engines and boilers. Ordinarily good engines do not utilize 3 per cent. of the original energy.

Now, the dynamo-electric machine presents a most favourable contrast in this respect with the steam-engine. This is clearly demonstrated by an experiment of Mr. Siemens, given in the very able paper "On the Electric Light" by Dr. Paget Higgs and Mr. J. R. Brittle, which gained the Telford medal of the Institution of Civil Engineers. In the dynamo-electric machine of Siemens, a cylinder of iron covered with copper wires is made to rotate at a high velocity in the field of two large electro-magnets, surrounded as usual by coils of similar wire. The rotation generates a current of electricity, which is led by conducting wires to the electric lamp. If, however, the current, instead of being led to the electric lamp, is conducted to the wires of the fixed electro-magnets of a machine similar to the first, the internal cylinder begins to rotate with considerable force, and the apparatus becomes electro-dynamic—that is to say, in the first machine the mechanical power is converted into electricity, and, in the second, the electricity is reconverted back into motive power. In the experiment referred to, the power expended to drive the first machine was carefully measured, as was also the power delivered from the second machine; and a remarkable result was arrived at—namely, that the second machine restored 49 per cent. of the power employed by the first. It follows that the average efficiency of each machine was 70 per cent.—that is to say, the first turned 100 units of mechanical power into 70 units of electricity, and the second reconverted the 70 electrical units into 49 mechanical units, for 0·70 multiplied by 0·70 gives 0·49. Therefore each of these machines had an average efficiency, or gave a practical return, of 70 per cent. of the force lent to them, instead of the 7 per cent. given by the best steam-engine—a most striking economy when it is remembered that one force has been converted into another. Even where no such conversion takes place, 70 per cent. is considered a high return. It is a very good water-wheel that renders back 70 per cent. of the force of the falling water, and I believe few steam-engines deliver at the main shaft much more than 70 per cent. of the motive force impressed on the piston.

While such a result is highly creditable to the inventor who produced it, there follows the inevitable conclusion that unless the laws of nature be changed, little or no improvement can be made in electro-dynamic machines. They can never reach the theoretical maximum. They have already utilized 70 per cent. of the force expended; even if they reached 80—the highest ever obtained by any machine—the improvement would only be 14 per cent. beyond their present duty.

It has been urged, from the analogy of the telegraph and gas lighting, that what seemed impossible has been made easy, and that in like manner the cost of producing electricity may be enormously lessened. Far be it from me to limit the sphere of invention, but here I say a law of nature bars the way, that there is a maximum which cannot be exceeded, and can only be approached; and I think, therefore, that I can lay down the following propositions:—

1. Mechanical force is the cheapest source of electricity yet discovered.
2. Existing dynamo-electric machines return in useful work 70 per cent. of the power expended.
3. As 80 per cent. is the largest return ever given by any machine, it follows that little improvement can ever be made in the production of electricity from mechanical force.

In these remarks I have limited myself to the one question. At another time I may point out the difficulties that arise from the low tension of the electricity produced, and the consequent difficulty of conveying it over any long distance.

Cork, Oct. 10, 1878. DENNY LANE.

The following correspondence, in reference to the comparative cost of gas and the electric light, appeared in *The Times* last week:—

To the Editor of "The Times."

SIR,—It is in France that the system of electric lighting has been most fully developed, and there alone has it been carried out on a large scale and under conditions in which its cost should be ascertained with considerable precision. It is, therefore, with interest that I have read, in the newly-issued volume of the proceedings of the Institute of Mechanical Engineers, a paper on this subject by M. Hippolyte Fontaine, from which I have copied the following extract for insertion in your columns, if you are able to afford it space.

Before appending the extract, I should like, as one who has closely observed the progress of electric lighting both in France and at home during the past twelve months, to offer an observation or two upon the subject. It appears to me that all estimates of the cost of electric lighting based upon the apparatus in use before the introduction of M Jablochkoff's improvements must be entirely fallacious; because, before the date of those improvements, not only was the electric lamp or regulator an expensive instrument, but it required a separate machine for working each light, whereas M. Jablochkoff's candles, each costing but a trifle, can be burnt a dozen or more at a time in a single machine. This advantage of securing numerous lights on one machine, each light being produced by extremely simple mechanical means, is also a characteristic of M. Rapieff's inventions, which are, in my opinion, improvements in some very important particulars upon the Jablochkoff candle, simple and beautiful as that invention undoubtedly is. It surely must be upon the working of these modern systems of electric lighting (the simplicity and cheapness of which are far beyond anything that was imagined until quite recently) that the cost of electric lighting as a competitor with gas must be based. I am unable, although having much to do with the development of M. Rapieff's improvements, to give just at present the exact cost of lighting under his system, but its cost is undoubtedly very small in comparison with that of the old systems, and certainly very much below the cost of gas for equal amounts of light.

But there are reasons why electric lighting should come into very large use, apart from the question of cost. There are, for example, many purposes for which electric light is so much more suitable than gas that the question of cost becomes one of minor importance. Picture galleries, for instance, present no comparison, as regards truth of colour, when lighted by gas and when lighted electrically. Fish markets, again (because of the true colours of fish being visible in electric light), would be advantageously lighted by electricity, even at a great increase of cost, supposing that to be necessary. Moreover, to my mind, the superiority of the electric light over that of gas for the lighting of public places and manufacturing establishments is so great that even if the electric light were less economical than gas, it could hardly be doubted, after the displays in Paris and at Mr. Hollingshead's theatre in the Strand, that it would, nevertheless, be largely applied, with little further delay, to mills, manufactories, railway-stations, docks, shipyards, warehouses, printing-offices, markets, mines, public buildings, bridges, squares, thoroughfare crossings, &c. It will not be on account of nice distinctions, or even of marked differences as regards cost, that the public will consent to be deprived of the power and brilliance of electric light in such places as I have just indicated.

The applications of electric lighting in this country have as yet been so rare that but few persons can speak authoritatively as to the exact cost when the electric light is applied on the best of modern systems, and it is for this reason that you will, I hope, consider the enclosed extract deserving of a place in your columns.

I have the honour to be, Sir, your obedient servant,

Oct. 7, 1878. E. J. REED.

[*Enclosure.*]

M. Ernest Manchon, proprietor of a cloth factory at Rouen, has lighted by electricity one of his workshops, formerly lighted by gas. The means are thus afforded for making a complete comparison of the two systems. The shop in question is rectangular; it is 16½ feet high, 78½ feet wide, and 138 feet long, covering an area of 11,000 square feet. It contains 160 looms, which had been very imperfectly lighted by 160 large gas-burners, by each of which 5½ cubic feet of gas was consumed per hour. These 160 burners have been replaced by six Gramme machines and six lamps, from which the light is projected on the roof, yielding a uniform light all over the shed, which is entirely satisfactory. Before the introduction of the new light, the joists stood out from the ceiling; but M. Manchon, without hesitation, incurred the expense of a new ceiling, on which he may now congratulate himself. After five months working with the new method of lighting, the following are the results of M. Manchon's calculations, showing the pecuniary benefit which he has derived from it:—

Electric Light—First Cost.

1. Roof—Carpentry	£156	10	0
2. „ Painting	49	19	2½
3. „ Workmen's time in fixing	5	0	0
4. „ Wood	2	6	0
5. Cost of five screens	5	12	0
6. Cloth for the same	1	8	0
7. Enclosure for the machines, carpentry, and glazing	8	9	6½
8. Enclosure for the machines, zinc edging at bottom	0	12	7½
9. Six Gramme machines, six lamps, and conductor	588	0	0
10. Shafting	57	17	0
11. Driving-belts—for transmitting the power, 690 feet; for the machines, 230 feet	29	9	9½
12. Framing for the shafting	3	4	2½
13. Carriage and sundry expenses	4	0	0
	£912	8	4

Working Cost of the Electric Light.

	Per Year. 666 Hours.	Per Hour.
Interest 6 per cent., depreciation 6 per cent., together 12 per cent., on £912 8s. 4d.	£109 9 9½	£0 3 3½
Driving power, hire	30 0 0	0 0 10½
Carbons, 27 inches per hour, at 6·53d. per foot (waste included)	40 14 8½	0 1 2½
Superintendence and maintenance of the machines	13 4 0	0 0 4½
Lubricating oil, 66 lbs.	1 13 7½	0 0 0½
Total	£195 2 1½	£0 5 10½

Gas Lighting—First Cost.

160 burners, at £1 11s. 8d. £253 6 8

Working Cost for Gas Lighting.

	Per Year. 660 Hours.	Per Hour.
Interest and depreciation, 12 per cent., on £253 6s. 8d.	£30 8 0	£0 0 11
Consumption of gas, at 7s. 2½d. per 1000 cubic feet	209 10 8½	0 6 3½
Repairs and maintenance of the fittings	8 0 0	0 0 2½
Glass shades	4 0 0	0 0 1½
Total	£251 18 8½	£0 7 6¼

From these comparative statements, it appears that the economy realized by electricity upon the cost of gas is as follows:—Annual saving £56 16s. 6d.; saving per hour, 1s. 8¼d.; saving per cent, 22·6. M. Manchon's figures are given just as he gave them; but it may be remarked that 15-horse power, the driving power required, scarcely consumes more than 55 lbs. of coal per hour, costing about 4½d. It was, however, a matter of great interest to learn the cost of electric lighting with hired driving power.

M. Delahaye, in a report to the Industrial Society of Rouen, referring to the lighting by electricity in M. Manchon's works, says:—

"On entering M. Manchon's factory one is favourably impressed by a striking sense of intense brightness, due even more to the nearly entire suppression of shadows than to the brightness of the light which pervades the shop. The workwomen are very well pleased with the light obtained. The foremen, who are no doubt best able to form a comparison between the two lights, since they never quit the building, do not hesitate to declare that the electric light is much superior to the gas light, and that the women, like themselves, are much less fatigued after the long hours, by reason of the absence of the heat radiated from the gas-reflectors which were immediately over their heads. M. Manchon has also pointed out to me a considerable advantage in the new light, due to the well-known property of the electric light of not altering even the most delicate shades of colour; the errors formerly fallen into by the workmen in renewing broken threads, or in refilling the shuttles, are thus prevented. The quality of the product is, in consequence, sensibly improved."

Satisfied with the success of the application of the electric light, M. Manchon has decided to extend it, in the course of next autumn, to a shop 183½ feet by 46 feet, containing, like the first-mentioned shop, 160 looms.

To the Editor of "The Times."

SIR,—Your correspondent, Mr. E. J. Reed, in his letter published in yesterday's issue, gives a copy of a statement of the cost of electric lighting as compared with ordinary gas lighting, extracted, he says, from a paper by M. Hippolyte Fontaine, of Paris, published in the proceedings of the Institute of Mechanical Engineers.

From the commencement of the observations of Mr. E. J. Reed, who says he has closely observed the progress of electric lighting, I was led to believe that the promised statement of comparative cost applied to the process of Jablochkoff, the more so as he says it appears to him that all statements of cost made previously to Jablochkoff's invention must be entirely fallacious. Why so does not clearly appear, any more at the end of his letter then at the beginning.

The statement of cost applies, as any one who is acquainted with the details of electric lighting can easily perceive, to that system which M. Fontaine, and, indeed, a great many other practical electricians, believe to be the simplest, cheapest, and best adapted for electric lighting—viz., one light upon one magneto-electric machine, the current in one direction, and a Serrin regulator with vertical carbons. Neither of these is an invention of either M. Jablochkoff or M. Rapieff. The magneto-electric machine is Gramme's; the Serrin regulator is the well-known instrument manufactured by Breguet and others. The mode of lighting is the same as that which has been in use now for many years at the South Foreland lighthouse, Holme's machine being there used instead of Gramme's. The Dover lighthouses have the enormous advantage over the systems of electric lighting at present proposed for lighting streets and public building, from having magnificent Fresnel lanterns, which refract every ray of light, and convert in the most perfect manner intensity of light into volume of light. This real triumph of science leaves far behind anything which has yet been done to attain the same result by other means.

An examination of the statement of cost shows that, although put in evidence by M. Fontaine, for whom every one who knows him must entertain the highest respect, it must be classed with those statements anterior to the inventions of Jablochkoff and Rapieff which Mr. E. J. Reed thinks fallacious. I think M. Fontaine, after looking over my remarks, will be inclined to make a re-examination of the statement. Assuming this statement to be correctly copied, I have first to remark that 6 per cent. for depreciation is certainly not enough for a magneto-electric machine making from 1000 to 1100 revolutions per minute. It is true that so long as the bearings of the "Bobine" are kept in order, there can be no rubbing between the "Bobine" and the electro-magnets; but, taking the fair wear and tear, and the probability of accidents to the machine through being improperly driven, 16 years is too long a life for a magneto-electric machine, without very extensive repairs, and renewals of parts of the machine—notably, the copper brushes for taking off the electricity. The Serrin regulators, very delicate and fragile instruments, are also classed with the magneto-electric machine at the same rate of depreciation. This item of depreciation must be reckoned at 10 per cent. at least. This will give us, on £588 for Gramme machines, Serrin regulators, and conductors, the sum of £58 16s. per year.

Shafting and driving-belts are classed at the same rate of depreciation—viz., 6 per cent. The real depreciation of these parts of the apparatus is at least 15 per cent., or on £87 6s. 9½d., £13 2s. a year.

Driving power estimated at only £30 per year, for 15-horse power at 11d. per hour, for only the actual number of hours the electric light is being used, is evidently an error—*i.e.*, unless some ardent admirer of the electric light gave the power for a nominal consideration for the sake of science. The cost of a 15-horse power engine and boiler in its cheapest form is only £250. M. Fontaine gives as the consumption of fuel for 15-horse power, 4½d. per hour (and exceedingly cheap, too); this, for 660 hours amounts to £15, without any charge for water, or for fuel used in getting up steam. The cost of an attendant, at £1 only per week, to look after the engine and boiler, amounts to £50; interest on cost of engine and boiler at 6 per cent., £15; depreciation of engine and boiler, 10 per cent, £25; or a total amount of £105 per year for driving power.

In the next item—viz., carbons for six lights—according to my experiments, with probably the identical kind employed by M. Manchon—Carré's carbons—I find that, including breakage and waste, one mètre per hour is not too much. Taking Carré's printed list, I find he charges 1 fr. 80 cents. per mètre in length, exclusive of carriage. 1s. 6d. per hour for 660 hours gives £49 10s. for this item.

Superintendence and maintenance of the magneto-electric machines, and their lamps or regulators, conductors, &c., figure in the working cost at only £13 4s., or only 4¾d. per hour for the number of hours the lights are burning. Now, it is a well-known fact that electric lights cannot safely be left without an attendant constantly watching them. At any moment they may be extinguished without any visible cause. This cause of extinction must be searched for immediately by a competent person. The supply of new carbons and the adjustment of the regulators, together with the care of the expensive magneto-electric machines and regulators during the whole time they are at work, necessitate the employment of a steady, strong-nerved mechanic, used to electricity and clockwork. Such a man will cost, at least, £2 per week, and the time he is not attending on the lights will be fully employed in keeping the lamps and magneto machines, conductors, and binding-screws, and all the apparatus, clean and in decent order. This item for 50 weeks will be £100.

Lubricating oil for the six machines and all the machinery is estimated at the trifling cost of only ½d. per hour. Excepting for the sake of appearances, I think it might have been left out altogether. If this item is to be seriously considered as correct, then it is astonishing.

The working cost of the electric lighting thus corrected will be as follows:—

Electricity.

Interest 6 per cent. on £912 8s. 4d. (given by M. Manchon as "first cost"	£54 14 10½
Depreciation of six Gramme machines and six Serrin lamps, conductors, &c., at 10 per cent. on £588	58 16 0
Depreciation of shafting and driving belts, 15 per cent. on £87 6s. 9½d.	13 2 0
Driving power, 15-horse power, fuel, attendance, and depreciation, without charge for water, at least	100 0 0
Carbons for the six lights, one mètre per hour, including waste —1 fr. 80 c. per mètre = 1s. 6d. per hour for 660 hours	49 10 0
Superintendence and maintenance of the machine by one man at £2 per week, say 50 weeks	100 0 0
Lubricating oil, ½d. per hour	1 13 7½
	£377 16 6

Or, £377 16s. 6d. divided by 680 hours gives 11s. 5d. per hour for electric light.

My experiments, by diagram taken from the engine while the lights were burning, show that the force required for one electric light, such as can be produced by a Gramme machine of the pattern here mentioned, is from 4 to 5 horse power. This is corroborated by observations that I have made in Paris upon three such machines at work regularly. It is necessary to note that the engines and shafting used to drive the electro-magnetic machines are always, as I have seen them driven, working at a high rate of speed—engines going from 130 to 150 revolutions per minute, with a pressure of steam equal to 30 lbs. on the square inch. Engines thus driven ought not to be spoken of as though they were working at their nominal horse power. Comparing this statement with the statement of cost of lighting by gas, taking the figures as printed, we find that the cost of gas is considerably lower than that of electricity—viz., 7s. 6¼d. per hour for gas, as against 11s. 5d. per hour for electricity. It may be remarked that 1½d. per hour for the breakage of such glass shades as are used in factories is rather severe on the gas. This is in France, with gas at 7s. 2½d. per 1000 feet.

With 16-candle gas at 3s. 6d. per 1000 cubic feet, as supplied to the City of London, the estimate for gas will be as follows:—

London Gas.

Interest and depreciation, 12 per cent. on £253 6s. 8d. (taking the figures given by M. Manchon as the "first cost")	£30 8 0
Consumption of gas, at 3s. 6d. per 1000	101 10 7
Repairs	8 0 0
Glass shades	4 0 0
	£143 18 7

Or, 4s. 4¼d. per hour.

These comparisons of the cost of the two modes of lighting are made with electricity in a highly scientific, though simple and cheap form of application, and gas in a crude and unscientific form. If the gas had been consumed in a scientific manner with the best form of burners, in lights equal to 100 candles each, properly distributed, the effect in light would have been far greater and more convenient for the work than when burnt in the unscientific manner which usually obtains in factories and large buildings.

The electric light is, doubtless, useful for many purposes; but there are great practical difficulties to be overcome before it can take the place claimed for it by its too enthusiastic admirers. As a scientific light it deserves attention, and, in places where it can be used properly, and all its advantages developed, no other mode of lighting will be likely to be preferred to it. But, as a general mode of lighting, it is eminently unsuitable. The difficulty of transforming its great intensity into volume of light is in the way of its adoption where cost is regarded. The subdivision of the electric current into many small lights, instead of a few large ones, only increases the difficulty in greater proportion as the lights become smaller. But, in any case, it can only succeed in replacing other systems of lighting by being superior to them in regard to steadiness, constancy, readiness, and ease of application, softness, and volume of light, together with cheapness.

I am carrying out a series of experiments with a view to ascertain its practicability as a means of lighting, and its cost, and I shall be very pleased to afford you fuller information as to these matters, in a short time, as the experiments proceed.

I have the honour to be, Sir, your obedient servant,

WILLIAM SUGG.

Vincent Works, Vincent Street, Westminster, S.W., Oct. 10, 1878.

Legal Intelligence.

HANLEY BOROUGH POLICE COURT.—Tuesday, Oct. 1.

(*Before Messrs.* R. E. Narramore *and* J. S. Crapper.)

LIABILITY FOR ARREARS OF GAS-RENT.

The *Potteries Examiner* Steam Printing Company were summoned by the British Gaslight Company for gas-rent from December last, amounting to £13 15s. 3d. This claim included arrears of gas-rent incurred by the late Potteries Co-operative Newspaper and General Printing Company, from whom the works were transferred to the present proprietors, who were now sued as defendants. The case was adjourned from the previous Tuesday, a statement having been made on behalf of the defendants, that the Printing Company who occupied the premises were defunct, and it was unfair that the defendants, who had succeeded them, should be charged for rent that was due from another company. It was stated, however, that at the adjourned hearing the Gas Company could prove the connection of the two Companies.

Mr. Richardson now appeared for the Gas Company, and Mr. Paine for the defendants.

Mr. Richardson, at the outset, asked for whom Mr. Paine appeared.

Mr. Paine said he appeared for Mr. E. P. Barker.

Mr. Richardson said that if Mr. Paine did not appear for the *Potteries Examiner* Company he had no *locus standi*. The Gas Company simply asked for an order, and would take one against the *Potteries Examiner* Company, running all risk as to what would follow upon levying a distress.

Mr. Paine said that Mr. Barker admitted that a portion of the gas charged for had been consumed by the *Potteries Examiner* Company.

Mr. Richardson, in opening the case, explained the circumstances of the sale and transfer of the newspaper and printing business. He said the gas was supplied to the establishment by the British Gaslight Company, and payments were made quarterly. The supply was continued until the month of March, 1878; and soon after that the change of proprietorship was effected, but notice of it was not given to the Company. On the 22nd of June, Mr. Lovatt, a gentleman connected with the Company, sent a letter to the defendants to the effect that he had been informed that they had been consuming gas for some time without having given notice to the Company, and he requested that a call should be made at the Company's offices for an arrangement to be made as to the supply of gas; and if that were not done the supply would be discontinued. He (Mr. Richardson) mentioned the letter for the purpose of proving his point—that there had been collusion—not in a fraudulent sense of that word—between the present Proprietors of the newspaper and the late Company. Mr. Barker sent a letter in reply, making some offer as to a reference. To that Mr. Lovatt wrote that the Gas Company could not accept a reference, and adding that if no deposit were paid, or guarantee entered into, the notice as to cutting off the supply of gas would be carried into effect. The Co-operative Printing Company terminated their tenancy in the middle of the quarter, and at a previous court the Solicitor who appeared for the defendants said they would be willing to pay for a portion of the gas consumed during that quarter. Now came the point as to what construction must be placed upon a clause in the Gas Company's Act of Parliament relative to arrears. He premised that it must be remembered a mere plea of ignorance of statute law was no defence. He believed he should be able to show that it was the intention of the Legislature to provide for a contingency of this kind, and maintained that due notice ought to have been given of the change of proprietors, so that the Gas Company might know if the incoming tenants would continue to use the gas. If the Gas Company had been aware of the change of proprietors taking place, they would, of course, have taken the precaution of securing liability upon the right persons. The 27th section of the Company's Act read as follows:—"In case any consumer leaves the premises where gas was supplied to him without paying to the Company the gas-rate or meter-rent due from him, the Company shall not be entitled to require from the next tenant of the premises payment of the arrears left unpaid by the former tenant, unless the incoming tenant agreed with the defaulting consumer to pay the arrears, or is acting in collusion with him." His contention, therefore, was that, for the purposes of the Act, what had been done had been done in the way of collusion; and he maintained that the defendants were, therefore, liable for the arrears of their predecessors. If the defendants had acted in a *bonâ fide* way, they would at once have given notice to the Gas Company, so that arrangements might have been made as to the subsequent payment of gas-rate. He could understand how there might be cases of exception, as, for instance, a person leaving a quarter's rent unpaid, and the incoming tenant agreeing to take the house from the landlord and not from the tenant; but in this case the plant, stock, and machinery of the business were handed over from the outgoing to the incoming tenants, and no notice was given to the Gas Company.

Mr. Hamshaw (Magistrate's Clerk) said that the case was that either there was an agreement for the defendants to pay the outgoing tenants arrears or there was collusion.

Mr. *Barker*, examined by Mr. Richardson, said that he carried on business as "The *Examiner* Steam Printing Works," and was the sole proprietor, though not of the *Examiner* itself. A Mr. George Taylor Platt was in partnership with him, but witness signed the cheques. He did not know anything about the place before he bought it from the other Company. The whole concern was bought together; and Messrs. Tomkinson and Furnival, of Burslem, were the Solicitors who had charge of the business for the Co-operative Printing Company. Mr. Platt was a reporter on the paper before the purchase was made. Witness could not remember signing a deed, but, of course, there was a deed of transfer. There was no agreement as to their taking the liabilities of the other Company. The conditions of the purchase were that there were to be no liabilities. Witness was himself the tenant, and should have to pay rent when the accounts with the old Company had been settled.

Cross-examined by Mr. Paine: He did not know anything as to the liabilities of the old Company, which was now being administered through the High Court of Justice. Messrs. Tennant conducted the business of the transfer on their account. Messrs. Tomkinson and Furnival, the vendors solicitors, had been in communication with them as to the gas account, and in a letter, dated the 19th of July last, they stated that the Gas Company would only be entitled to the amount due from the time of their (the defendants) entering upon the tenancy. They had always been ready and willing to pay their own share of the gas bill; but they objected to pay for gas they had not consumed. When the transfer was made, due notice of it was given in the newspaper, and there was also an alteration of the sign at the premises.

Mr. Hamshaw, at this point, said he should advise the Magistrates that Mr. Richardson had failed to substantiate liability on the part of the defendants for the outgoing tenant's arrears. With respect to the 27th clause of the Company's Act, and the requirement as to notice, he said it was a matter of common practice for people to go out of houses and others come in without any notice being given to the Gas Company; and he rather thought the onus was thrown upon the Gas Company to ascertain for themselves who their consumers were.

Mr. Richardson said that to do so it would be necessary to go round making periodical inquiries amongst the consumers; and that would, indeed, be an unreasonable thing.

Mr. Paine observed that notice was given of the change of proprietors; and evidence was also offered to the effect that formal intimation had been given at the Gas Company's office that such change had been effected.

This was denied on the part of the Gas Company's officials.

Mr. Narramore said the Magistrates considered they could not make an order for the entire sum claimed, but only for the amount the defendants were liable for during their tenancy. They, however, considered the defendants should have taken care to inform the Gas Company of the change of proprietors, as they would certainly be aware there would be some gas liability consequent upon such a transfer.

An order was then made upon the defendants for the payment of £3 14s. 6d., the proportion of gas-rate due from the 20th of April, when defendants became tenants.

Mr. Richardson applied for costs.

Mr. Paine opposed, stating that the Gas Company had really failed in their case. No proof of any collusion had been given, and the order was only for the sum which defendants had previously expressed willingness to pay.

Mr. Narramore said there was certain *primâ facie* ground affording justification for the course the Gas Company had taken, and so Court costs would be allowed.

LAMBETH POLICE COURT.—Friday, Oct. 11.

(*Before Mr.* Benson.)

AN OBSTINATE WATER CONSUMER.

Mr. *Henry Shaw*, printer, Borough Road, was summoned by the Southwark and Vauxhall Water Company for neglecting and refusing to pay the sum of £3 17s. 6d., for five quarters water supplied to him up to July last.

Mr. Lanfear appeared for the Company.

The defendant was not in attendance, but one of the summoning officers of the Company proved the serving of the summons on his son, on the premises, on Monday last.

Mr. *G. N. Payne*, Superintendent of the Company, said that the defendant was supplied with water by the Company at the rate of £3 3s. a year, and that he was indebted to the Company for five quarters up to July last.

Mr. Benson observed that he recollected defendant being previously summoned by the Company. He believed that the water was cut off after he had tendered the money due.

Mr. *Payne* said that defendant never paid his rate until compelled, and on that occasion, while the men were sent to cut the water off, he came and paid the money.

Mr. *C. J. Kendall*, one of the collectors employed by the Company, said he had frequently called for the money, and on the last occasion, defendant said he would see about it, and told witness he should communicate with the Company.

Mr. Benson made the order for the payment of £3 17s. 6d. and costs.

Miscellaneous News.

METROPOLIS WATER SUPPLY.

At the Meeting of the Board last Friday—Mr. E. D. Rogers in the chair,

Mr. Watkins moved—"That a return (in detail) be presented to the Board of the cost incurred in preparing evidence, professional charges, experiments, and all other charges and expenses caused in connection with the Bills, laid before the House of Commons last session, having for their object the purchase of the existing Water Companies, and a new supply of water to the Metropolis."

The motion was seconded by Mr. Legg, who said that it was highly desirable this evidence should be laid before the public.

Mr. Tolhurst, as an amendment, moved the previous question, which was seconded by Major Munro.

Dr. Brewer said it was necessary, before the Board entered upon another campaign, that they should have the information asked for by Mr. Watkins. It was only such information as they had a right to have, and as the public most reasonably expected.

Mr. Runtz said he wished for the information Mr. Watkins asked for, but was not prepared to vote with him, because his motion, as it stood, was an implication that the Board were endeavouring to conceal something from the public which they ought to know, whilst such a thing was entirely incorrect.

Several other members having spoken on the subject, the amendment was, on a division, carried by 15 votes to 12.

The Registrar-General publishes the following report on the average daily quantity of water supplied by the London Water Companies during the month of September. According to it, 137,639,505 gallons, or 625,359 cubic mètres of water (equal to about as many *tuns* by measure, *tons* by weight), were supplied daily; or 250 gallons (113·6 decalitres), rather more than a *ton* by weight, to each house, and 35·3 gallons (16·0 decalitres) to each person, against 33·7 gallons during September, 1877:—

Companies.	Number of Houses, &c., supplied in Sept., 1877.	Number of Houses, &c., supplied in Sept., 1878.	Aver. Daily Supply of Water in Gallons* during Sept., 1877.	Aver. Daily Supply of Water in Gallons* during Sept., 1878.
Total supply	537,039	549,726	128,412,301	137,639,505
From Thames	252,518	259,713	64,050,489	69,613,872
„ Lea and other Sources	284,521	290,013	64,361,812	68,025,633
Thames.				
Chelsea	28,741	29,014	8,972,100	8,745,700
West Middlesex	49,821	51,110	10,060,392	10,063,963
Southwark and Vauxhall	79,000	81,575	19,450,000	24,198,933
Grand Junction	37,683	38,462	11,466,797	12,171,836
Lambeth	57,273	59,552	14,101,200	14,435,500
Lea and other Sources.				
New River	125,897	127,267	28,153,000	29,205,000
East London	113,192	117,034	28,600,650	29,895,800
Kent	45,432	45,662	7,608,102	8,924,833

* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for Sept., 1878, as compared with that for the corresponding month of 1877, shows an increase of 12,687 houses, and of 9,227,204 gallons of water supplied daily. The return from the Southwark and Vauxhall Company shows an increase of 2575 houses, and of 4,748,933 gallons supplied daily, compared with the return for September, 1877.

SOUTH METROPOLITAN GASLIGHT COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held on Monday, the 7th inst., at the Terminus Hotel, London Bridge—Captain T. B. Heathorn in the chair.

The Secretary (Mr. George Livesey) read the notice of meeting, and the following report and statement of accounts were submitted:—

The last report stated that the price of gas had been reduced to 3s. per 1000 feet from Christmas last.

The Directors have now the pleasure of informing the shareholders that, notwithstanding this reduction, the amount of profit on the half year's working is amply sufficient to warrant the recommendation that the dividend shall be increased to 11½ per cent. per annum, which is the rate to which they are entitled. This will require £27,600, thus leaving a considerable balance to carry forward.

The business is increasing at its usual rate. The works and mains, however, are capable of supplying considerably more gas than will be required even in the depth of winter, the extensions of the last few years having provided a satisfactory margin of working power.

The whole of the new capital of £250,000 created in 1869 having been called up, the Directors will this day submit a resolution authorizing the conversion of the old and new shares into stock.

No. 1.—STATEMENT OF SHARE CAPITAL *on June* 30, 1878.

Acts of Parliament authorizing the Raising of Capital.	Description of Capital.	Standard Dividend.	Number of Shares issued.	Nominal Amount of Shares.	Called up per Share.	Total paid up.	Amount not paid up.	Total Amount authorized.
5 Vict., cap. 79	Share.	10 per cent.	4,000	£50 0 0	£50 0 0	£200,000 0 0	..	£200,000 0 0
			4,000	12 10 0	12 10 0	50,000 0 0	..	50,000 0 0
32 & 33 Vict., cap. 130	Do.	Do.	20,000	12 10 0	11 10 0	230,000 0 0	£20,000 0 0	250,000 0 0
39 & 40 Vict., cap. 229	Do.	Do.	..	..	..	..	250,000 0 0	250,000 0 0
						£480,000 0 0	£270,000 0 0	£750,000 0 0

No. 2.—STATEMENT OF LOAN CAPITAL.

Acts of Parliament authorizing Loan Capital.	Description of Loan.	Rate per Cent. of Interest.	Total Amount Borrowed.	Remaining to be Borrowed.	Total Amount Authorized.
32 & 33 Vict., cap. 130.	..	Not exceeding 5 per Cent.	Nil.	£62,500	£62,500 0 0
39 & 40 Vict., cap. 229	..	Ditto.	Nil.	187,500	187,500 0 0
				£250,000	£250,000 0 0

No. 3.—CAPITAL ACCOUNT.

Dr. **Cr.**

To			By	Certified to Dec. 31, 1877.	Received since that Date.	Total to June 30, 1878.
To Expenditure to Dec. 31, 1877	..	£458,540 5 7	Description of Capital.			
Expenditure during half year to June 31, 1878, viz.—						
New buildings and machinery in extension of works	£4,147 14 9		By Shares, at £50 each	£200,000 0 0	..	£200,000 0 0
New and additional mains and services	8,040 0 6		Do., at £12 10s. each	50,000 0 0	..	50,000 0 0
New and additional meters	425 14 0		Do., at £12 10s. each, £11 10s. paid	230,000 0 0	..	230,000 0 0
		12,613 9 3				
Total expenditure	..	£471,153 14 10				
Balance	..	8,846 5 2				
		£480,000 0 0		£480,000 0 0	..	£480,000 0 0

No. 4.—REVENUE ACCOUNT, *for the Half Year ended June* 30, 1878.

To			By			
To Manufacture of gas—			By Sale of gas—			
Coals, including dues, carriage, unloading, and trimming. (See Account No. 9)	£36,070 4 7		Common gas (per meter) at 3s. per 1000 cubic feet	£66,977 6 1		
Purification, including £378 5s. 4d. for labour	2,318 15 3		Less discount	102 14 9		
Salaries of Engineer, Superintendent, and officers at works	1,292 9 6				£66,874 11 4	
Wages (carbonizing)	9,024 9 10		Public lighting and under contracts (see Statement No. 11)		7,891 3 1	
Repairs and maintenance of works and plant, materials, and labour—less £200 12s. 0d. received for old materials	5,613 13 6					£74,765 14 5
		£54,319 12 8	Rental of meters			1,631 10 4
Distribution of gas—			Residual products—			
Repair, maintenance, and renewal of mains and service-pipes, including labour	£1,841 0 6		Coke, less £1155 15s. 2d. for labour and cartage	£14,612 1 11		
Salaries and wages of officers (including Rental Clerks)	1,854 5 5		Breeze, less £168 8s. 0d. for labour and cartage	346 15 0		
Repairing and renewals of meters	758 0 3		Tar	4,756 4 4		
		4,453 6 2	Ammoniacal liquor	5,592 0 0		
Public lamps—					25,307 1 3	
Lighting and repairing		1,943 12 2	Rents receivable			199 15 0
Rents, rates, and taxes—			Transfer fees			2 2 6
Rents payable	£286 6 0					
Rates and taxes	2,212 18 10					
		2,499 4 10				
Management—						
Directors allowance	£771 0 0					
Salaries of Secretary and Clerks	847 3 10					
Collectors commission	1,616 19 8					
Stationery and printing	288 15 4					
General charges	357 13 0					
Company's Auditors	50 0 0					
		3,931 11 10				
Law charges		16 15 4				
Bad debts		664 3 5				
Superannuation-fund		170 14 0				
Gas Referees and Official Auditor		62 1 8				
Total expenditure		£63,961 2 1				
Balance carried to net revenue account, No. 5		33,845 1 5				
		£101,906 3 6				£101,906 3 6

No. 5.—PROFIT AND LOSS (Net Revenue Account).

Interest on deposits	£71 16 5	Balance from last account	£39,432 7 3
Balance applicable to dividend on ordinary share capital	47,458 19 8	Less dividend on ordinary capital for the half year ending Dec. 31, 1877	25,850 0 0
			£13,582 7 3
		Amount from revenue account, No. 4	33,845 1 5
		Interest on moneys on deposit	103 7 5
	£47,530 16 1		£47,530 16 1

No. 6.—RESERVE-FUND.

Balance on June 30, 1878	£20,636 4 8	Balance on Dec. 31, 1877	£20,000 0 0
		Interest on amount invested	636 4 8
	£20,636 4 8		£20,636 4 8

No. 7.—RENEWAL-FUND (Leasehold).

Balance on June 30, 1878	£10,399 17 4	Balance on Dec. 31, 1877	£10,236 16 3
		Interest on amount invested	163 1 1
	£10,399 17 4		£10,399 17 4

No. 8.—INSURANCE-FUND.

Balance on June 30, 1878	£7,942 17 10	Balance on Dec. 31, 1877	£7,894 16 8
		Interest on amount invested.	48 1 2
		£3142 17s. 10d. invested in Three per Cent. Consols. £4800 to be invested.	
	£7,942 17 10		£7,942 17 10

No. 9.—STATEMENT OF COALS.

Description of Coal.	In Store, Dec. 31, 1877.	Received during the Half Year.	Carbonized during the Half Year.	Used during the Half Year.	In Store, June 30, 1878.
	Tons.	Tons.	Tons.	Tons.	Tons.
Newcastle coal	13,891	41,704	50,739	100	4,756
Cannel coal	1,597	1,177	1,387	..	1,387
	15,488	42,881	52,126	100	6,143

No. 10.—STATEMENT OF RESIDUAL PRODUCTS.

	In Store, Dec. 31, 1877.	Made during Half Year (estimated.)	Used in the Half Year (estimated).	Sold in the Half Year.	In Store, June 30, 1878.
Coke . Chaldrons of 36 bushels.	3,578	51,663	17,148	35,863	2,230
Breeze do. 36 do.	310	4,472	..	4,539	243
Tar . Gallons	39,822	547,755	1,500	545,393	40,684
Ammoniacal liquor—Butts of 108 gallons, 10-oz. strength.	2,774	10,814	..	12,631	957

No. 11.—STATEMENT OF GAS MADE, SOLD, &c.

Description of Gas.	Quantity made, partly measured in Gasholders.	Quantity Sold.			Quantity used on Works, &c., partly estimated.	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lamps.
		Public Lights and under Contracts (estimated).	Private Lights (per Meter).	Total Quantity sold.				
	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	
Common	518,060	43,743	446,515	490,258	5,000	495,258	22,802	4,166

No. 12.—BALANCE-SHEET.

To Capital—			
For balance, per account No. 3		£8,846 5 2	
Reserve-fund—			
For balance, per account No. 6		20,636 4 8	
Renewal-fund—			
For balance, per account No. 7		10,399 17 4	
Insurance-fund—			
For balance, per account No. 8		7,942 17 10	
Net revenue account—			
For balance, per account No. 5		47,458 19 8	
Sundry tradesmen, for amount due for coals, stores, and sundries		9,123 14 9	
Deposits by consumers		5,433 16 9	
Property-tax account		358 12 3	
Dividend account (outstanding)		54 14 5	
		£110,255 2 10	
By Cash at bankers			£31,640 8 5
Amount invested in Three per Cent. Consols—			
Reserve-fund	£20,636 4 8		
Renewal-fund	10,399 17 4		
Insurance-fund	3,142 17 10		
		34,178 19 10	
Cash in hand for freight, accounts, &c.			1,000 0 0
Stores in hand—			
Coals	£5,816 19 1		
Coke and breeze	1,179 5 0		
Tar and ammoniacal liquor	772 13 0		
Sundry stores	2,914 11 2		
		10,683 8 3	
Accounts due to the Company—			
Gas and meter rental, quarter ending June 30, 1878	£28,552 13 6		
Arrears outstanding	999 15 4		
		29,552 8 10	
For coke and other residual products		3,001 13 9	
Sundries		198 3 9	
		£110,255 2 10	

On the motion of the CHAIRMAN, seconded by Mr. HILL, the report and accounts were adopted.

The CHAIRMAN moved—"That a dividend at the rate of 11½ per cent. per annum, for the half year ending June 30 last, be now declared, and made payable on the 8th inst., and that the warrants be transmitted to the Proprietors by post." He added that the Company were in such a state of prosperity that there was no probability of their not continuing to pay the same dividend.

Mr. JENKINS seconded the motion, which was carried.

The meeting was then made special.

The CHAIRMAN moved—"That in accordance with the powers conferred by the Company's Act of Parliament, the whole paid-up capital of the Company be converted and consolidated into stock, and that such stock be divided among the Shareholders, according to their respective interests therein."

Mr. FOSTER seconded the motion.

A SHAREHOLDER asked if the present shares were to be sent in and returned.

Mr. LIVESEY said the Directors wanted this authority from the Shareholders, and then they would adopt the best and most convenient means for effecting the object they had in view.

The CHAIRMAN said what the Directors contemplated was putting all the shares of every denomination into one stock.

The resolution was carried.

Mr. RANDALLS asked if the next capital raised would be loan capital or shares.

Mr. LIVESEY: Loan. We are bound to issue £62,500 of loan capital before we issue further shares, and the shares will be sold by auction.

Mr. STORR said he was perfectly satisfied with the state of the Company; but, for the benefit of the Shareholders generally, he wished to ask the Secretary and Engineer if he could give them any information about the new electric light. He had himself seen it, and had gone into the question very deeply and carefully; but he did not think that gas shareholders had any reason for fear.

Mr. LIVESEY: Mr. Chairman and gentlemen, I have hitherto refrained entirely from saying anything whatever about the electric light, because human nature is so perverse that anything one may say is likely to be wrongly interpreted. I believe it is quite possible, by talking so much about this electric light, to do a great deal more harm than good. After all the utterances on the subject, there has been a further depreciation of gas shares. The public are rather inclined to say that shareholders would not talk so much about it unless they were afraid of it. For my own part, I can say that I should be very glad indeed to see the electric light cheapened and improved, and made available for lighting the large open spaces of our City. London is very badly lighted, and if the electric light could be brought to bear in such places as in front of the Mansion House, and Queen Victoria Street, the public would never be satisfied with such a modicum of light as there is now in the small streets, and they would want a great deal more gas. It was stated by Mr. Baddeley at the Chartered Gas Company's meeting, that the public lighting amounted to only one per cent. of the total supply. He was mistaken. It is from 7 to 10 per cent.; but even if that were taken from us, it would amount to only one year's increase, so that the Companies would rest on their oars, and not need any increase of plant for twelve months. That is supposing that the electric light could be made available for all the streets and public places. I maintain that it is not adapted for such purposes, except in some favourable positions. What we want is, not a concentrated light, but a diffused light. The light of the sun is, by the refractive and reflective action of the atmosphere and the clouds, diffused all over the earth. The electric light cannot be so diffused. You will have very brilliant centres of light at long intervals, and, as you increase the distance from a light, you have to increase its intensity enormously, not in proportion to the distances at which you are from the light, but according to the square of the distance. For instance, I am 10 feet from a light. If I have sufficient light from it to read small print, and then an electric light is put 100 feet from me, the electric light must give not 10 times as much light, but 100 times, in order to enable me to read with the same ease. There is, therefore, a great want of economy in using this enormously powerful light. Then there is another thing about the electric light that is inherent in it—namely, its extraordinary intensity. So far as I have been able to make out, an electric light equal to 2000 candles is no bigger than one's finger-nail. You cannot diminish the intensity; you may diminish the size very slightly. Therefore, for the purpose of ordinary lighting, I maintain that the wonderful intensity of the electric light renders it totally unsuitable. I went recently to see the lights outside the Gaiety Theatre, and was thoroughly disappointed. I expected to see something much more brilliant, and I can only say to any shareholder, "Go and look at those lights, and if you think that anything of that sort is going to interfere with your property, I can say nothing further to you." Then it is very commonly supposed that this electric light can be produced for next to nothing. You can only have it by an expenditure of power. So far as light against light is concerned, you can have gas light where you want it at a smaller expenditure than the electric light. But even if the electric light were to be improved and cheapened, its inherent qualities render it totally unfit for ordinary lighting. As far as I myself am concerned, if it should displace gas I should be ruined, for 90 per cent. of my eggs are in this basket, as well as my salary; but I do not intend to sell a single share, and if I had money idle I would buy more.

Mr. HOBSON said the Gaiety light was hardly a fair example of the power of the electric light. In Paris, the globes that the lights were covered with were better than those of the Gaiety. The concentrated point of flame was seen almost half a mile off from the Gaiety; but it was not so easy to see it in Paris. To his mind, the great hindrance to the development of the electric light was the necessity for a powerful engine, and he thought it would be much more expensive than gas. He, like Mr. Livesey, had a very large per centage of his property in gas shares; but he had not sold a single share. He was ashamed of the poorness of the public lighting which was given in London; but it was the fault of those who contracted for the lamps. That light could be very much increased, and the lamps could give 50 per cent. more light than they did at present. It was certain that there were many places where it would be quite out of the question to use such a powerful light as the electric light, and he felt that, on the whole, gas would hold its own, particularly where a Company sold it, as the South Metropolitan did, at 3s. per 1000 feet.

Mr. BUTLER said there was a great difficulty in finding employment for the rising generation; but if the electric light was extensively used, he thought it would be a first-rate thing for gas shareholders to bring up their children as oculists. He was much more afraid lest the South Metropolitan Company should amalgamate with other Companies on terms which were not beneficial to the Shareholders.

Mr. LIVESEY said there was no question of amalgamation at present, the negotiations having been broken off.

Mr. BUTLER said the Company held a considerable amount of land, and he supposed the present valuation would greatly exceed the amount that was given for it.

Mr. LIVESEY said the freehold land belonging to the Company was about 30 acres, and it stood in the books at something like £33,000, which was very near its value.

Mr. BUTLER said he could hardly imagine that land so near London was only worth £1000 an acre.

Mr. LIVESEY said his father bought 14 acres there at £500 an acre originally, and the rest was bought at £1100 an acre about ten years ago, and this was considered a very excessive price. A great deal of the land in that locality was still used as market gardens. The land held by the Company was extremely valuable for a gasholder station, but not so valuable for manufacturing purposes. The Company's reserve-fund was considerably more in proportion than that of The Gaslight and Coke Company. He thought the figures were something like £135,000 for The Gaslight and Coke Company to 8½ millions of capital, while the South Metropolitan Company had £30,000 to ½ million of capital.

Mr. BUTLER said that as there was a prospect of continuing to pay a dividend of 11½ per cent., he thought it would be wise to continue to work the concern themselves. Another difficulty arose in the case of trustees. In some wills the properties were so left that they could remain in the same securities as those in which the testator left them; but in his own case, if those securities were amalgamated, the property would have to be invested in Consols or mortgages, which, of course, would cause a loss to the tenants for life.

The CHAIRMAN: I am sure the Board will second me in saying that we are very much obliged to Mr. Butler and to any other gentlemen who will give us their views as to what would be beneficial for the Company, either with regard to the present or the future. We should never think of taking any steps which would lead to any bond whatever, unless it was fully in accord with the wishes of our Shareholders, and we should take every opportunity of ascertaining those wishes before we did anything of the kind. We are bound to do so.

Sir CHARLES CROSSLEY said he had long been associated with gas companies, and he had witnessed previous panics with regard to gas affairs. Twenty years ago there was a panic with regard to an electric light, and persons came to him to beg him to sell all their shares. He was one of the largest shareholders in the Metropolis in gas companies; but he had no fear of the electric light, and he had not sold a single share in any company. With regard to the depreciation in the value of the shares, he was aware that a great many gentlemen said, "What does it matter, so long as we get the same dividend?" He liked to see his property quoted at a fair value. He believed that the persons who were interested in the electric light were likely to become very good customers to the gas companies, because it was a question whether the engines would not be worked by gas more economically than by the ordinary fuel. He was largely interested in The Gaslight and Coke Company; but he had such a very high opinion of the South Metropolitan Company that he would be sorry to see any amalgamation take place for a long while to come.

Mr. T. R. HILL proposed a vote of thanks to the Directors.

The motion was seconded by Mr. RILEY, and agreed to.

The CHAIRMAN: I am quite sure that as long as we sit here as a Board, we shall try to deserve your approbation. It is of great importance, upon an occasion of this kind, to get the opinion of our Shareholders; otherwise we cannot properly inform our minds, and it is only by going about among

people who are accustomed to the estimation of property, and to business affairs, that we can hope to get the most accurate appreciation of our own value. There is nothing to be said against this Company. We are very prosperous, and all we have to do is to see that we get the greatest prosperity we can.

Sir CHARLES CROSSLEY proposed a vote of thanks to the Secretary and Engineer. Mr. Livesey's name, he said, was known not only throughout the gas world, but throughout the whole scientific world, and it was a great advantage to the Company to have as their officer a gentleman holding such a high position.

The motion was seconded by Mr. MALTBY, and carried unanimously.

Mr. LIVESEY: The cordial manner in which this vote has been received is exceedingly gratifying to me. My interests are so bound up in the South Metropolitan Gas Company, that I am anxious to see it prosper to the greatest possible extent. It may possibly allay a little of Mr. Butler's alarm if I state that the Directors have no power whatever to make any agreement in regard to amalgamation without the authority of the Shareholders. If any proposal is made by another Company, the Directors must submit it to the Shareholders before it can be adopted, and unless they can convince the Shareholders that it would be good for them, the Shareholders will, of course, reject it. Mr. Hobson says the Gaiety lamps do not afford a fair comparison with the Paris lamps. That simply means that the light is more obscured at Paris—that the lanterns are of a denser character, and obstructs the rays of light, and there is a greater proportion of loss. I feel that the electric light is no more suitable for ordinary lighting than a locomotive engine would be for drawing a gentleman's carriage or a donkey cart. Mr. Siemens has said that the two have separate and independent circles, and they will scarcely interfere with, or overlap each other.

The proceedings then terminated.

SWANSEA GASLIGHT COMPANY.

The Thirty-Fifth Half-Yearly Ordinary Meeting of the Shareholders of this Company was held on Friday, the 4th inst.—THOMAS PHILLIPS, Esq., in the chair.

The SECRETARY and MANAGER (Mr. Thornton Andrews) read the notice convening the meeting, and the following report of the Directors was submitted:—

Your Directors have pleasure in laying before you their report and statement of accounts for the half year ending the 30th of June last.

The sale of shares in April realized a total of £12,026 5s., of which sum £3776 5s. is premium. The price per share amounted to an average of £36 9s., which your Directors consider as a satisfactory indication, in the estimation of the public, of the continued value of the property.

Your Directors regret to inform you that Mr. Philip Price lately resigned his appointment as Auditor, in consequence of serious illness, which terminated fatally on the 23rd ult. It will be at the option of the Shareholders that another Auditor be elected at this meeting.

The works, plant, and mains are in an efficient state of repair. The No. 1 holder, erected in 1861, has been examined and put in order, and the extension of retort-house and retort-beds completed.

The Directors recommend the payment of the usual dividend at and after the rate of 10 per cent. per annum on the £6000 original share capital, and 7½ per cent. per annum on the £86,500 new share capital, which will absorb £3356 17s. 1d., the balance of profit to be carrried to the reserve-fund.

On the motion of the CHAIRMAN, it was resolved—"That the report and accounts for the half year ending the 30th of June last, now presented and read, be received, adopted, and entered on the minutes of the Company;" and "That a dividend at and after the rate of 10 per cent. per annum on the original shares, and 7½ per cent. per annum on the new shares, for the half year ending the 30th of June last; as also 7½ per cent. per annum on the new shares raised on the 5th of April last, be, and the same is hereby declared payable at the Glamorganshire Bank, at Swansea, immediately after the termination of the business of this meeting."

Mr. George Allen was then elected Auditor of the Company in place of Mr. Philip Price deceased.

A vote of thanks was passed to the Directors for their attention to the affairs of the Company during the past half year; and to Mr. R. G. Cawker for auditing the accounts to the 30th of June last.

It was also resolved—"That the thanks of this meeting be presented to the Manager for his uniform and zealous attention to the important duties of his office."

A vote of thanks to the Chairman terminated the meeting.

PRESENTATION TO MR. AND MRS. BLACKLEDGE.—Some few weeks since W. Blackledge, who has been Manager of the Rossendale Union Gas Company since the appointment was vacated by Mr. Thomas Newbigging (author of the "Gas Manager's Handbook," "History of Rossendale," &c.), resigned his position, which he had held for nearly eight years, and the Directors advertised for a new Manager. There were a number of applicants for the office, and the Directors, at a recent meeting, appointed Mr. Riley, of Brighouse, near Leeds, as Manager. Mr. Blackledge gained many friends since he came into the district from Chorley, where he held the position of Manager of the gas-works there. The *employés* of the gas-works and other friends consequently resolved to present both him and Mrs. Blackledge with testimonials, and this was accordingly done on Saturday evening, the 5th inst. The testimonial to Mr. Blackledge comprised a handsome timepiece under glass shade, with elegant side ornaments to match, and a beautifully illuminated address, in a massive gilt frame. The gift to Mrs. Blackledge consisted of a handsome tea and coffee service in silver, and of exquisite design. The inscription on the tea and coffee service was—"Presented to Mrs. Blackledge, as a token of respect, by the workpeople and friends of the Rossendale Union Gas Company, September, 1878." On the timepiece was the following:—"Presented to Mr. William Blackledge, late Secretary and Manager to the Rossendale Union Gas Company, as a token of respect, by the workpeople and friends, on the occasion of his resigning that position, September, 1878." One of the local newspapers, speaking of this matter, says: "The public of Rossendale generally will have learnt with regret of the resignation of Mr. William Blackledge, for nearly nine years past Manager of the Rossendale Union Gas Company's works. Mr. Blackledge came to Rossendale in March, 1870, taking charge of the gas-works on the 1st of that month; and during the whole of his Managership he has, by assiduous attention to all matters pertaining to his office, won the goodwill and esteem not only of those immediately connected with him in business, but of the public at large. Unassuming in manner, of genial temperament, and withal prompt in remedying to the best of his ability any defects in the gas supply of the district brought under his notice, his removal from our midst will be regretted on all hands; and the general opinion is that the Rossendale Union Gas Company will lose the services of a gentleman of sterling qualities both in public and private life. During his oversight of the Company's works, the balance-sheets presented by him to the Directors show that upwards of £10,000 have been paid in back dividends, over and above the maximum dividends; while between £30,000 and £40,000 has been expended in various extensions of the Company's works."

MANCHESTER CORPORATION GAS-WORKS.

REPORT OF THE GAS COMMITTEE FOR THE YEAR ENDING JUNE 24, 1878.

The Gas Committee present the following report:—

Your Committee submit an abstract of the accounts of the gas department for the year ending June 24, 1878, and also the usual tabular and explanatory statements.

Appendix A shows the amount of lamp and private rentals derived from the townships, within and beyond the city respectively, for the past two years.

Appendix B, the quantity of gas transmitted from the works in the daytime, and during the whole 24 hours of the day in each month, for the same period.

Appendix C, the number of meters in use on June 24, 1877 and 1878, respectively.

Appendix D, the length and sizes of main-pipes laid and taken up during the year, and also the total now in use.

Appendix E, the amount of profit and the mode of its appropriation; the amount of borrowed money owing, and the excess of assets, &c., in each year from 1862 to the 24th of June last.

The rental for the past year (including meter-rents) has amounted to the sum of £322,531 16s. 2d., being a decrease of £11,209 3s. 6d.

The profit is £111,594 3s. 4d., as against £100,539 16s. 7d. in the previous year, and is appropriated as follows:—Interest on loans, £15,030 8s. 5d.; set aside and transferred to capital account towards liquidation of the mortgage debt, £27,408 18s. 7d.; portion of surplus payable to the improvement department, £51,996 5s. 3d.; leaving a balance of £17,119 5s. 4d., which your Committee propose to carry to the reserve-fund.

The number of consumers has increased 1·89 per cent., amounting now to 73,038, as against 71,678 the previous year.

The quantity of gas supplied has amounted to 2,142,997,000 cubic feet, being an increase of 72,881,700, or 3·52 per cent. over the previous year.

Your Committee submit the report of Mr. John Leigh, the Consulting and Analytical Chemist to this department, with regard to the purity and illuminating power of the gas during the past year; and also the report of Messrs. S. E. Cottam and Son, the Auditors appointed by the Council, in reference to the accounts of this department.

"*Officer of Health's Department, Town Hall,*
"*Manchester, Sept.* 9, 1878.

"To the Chairman of the Gas Committee.

"Sir,—I have the honour to report to you that the average illuminating power of the Manchester gas during the past year has been equal to that of 20·43 London standard candles.

"The gas has been tested photometrically at the Gaythorn and at the Rochdale Road stations utmost daily. The standard of comparison adopted has been the light of a London standard sperm candle burning at the rate of 120 grains per hour. The average of the highest readings of the photometer has been equal to 21·65 candles, and of the lowest 19·2 candles.

"The gas has been tested daily for sulphuretted hydrogen and for ammonia. It has also been allowed to flow continuously through test solutions, and the amount of impurity in large volumes of the gas has been determined. As the gas has passed through these solutions during the night as well as the day, and during Sundays, as well as on ordinary days, any negligence in the purification at these times would have been detected.

"To the daily tests, the gas has very rarely yielded any traces of sulphuretted hydrogen. From the large volume of gas flowing through the test solution (not less than 500 cubic feet per month), rarely has any of this impurity been separated, and in no case more than a small fraction of a grain.

"The quantity of ammonia in the gas has been almost uniformly below one grain in 100 cubic feet; generally, indeed, the quantity has been inappreciable.

"The carbonic acid in the gas has varied from 1 to 2¾ per cent. of the volume of the gas. From the great difference in the amount of pyrites in the different coals and cannels employed, the amount of sulphur existing in the gas in combination with carbon has varied considerably.

"A large number of trials have also been made—indeed, during a considerable part of the year, continuously made—on the condensation of the illuminating constituents by bromine, semi-hydrated sulphuric acid, &c. The number of volumes of oxygen required for the combustion of the gas has also been determined, and the specific gravity of the gas ascertained. Some trials on a large scale have also been made on the conversion of some of the illuminating constituents into nitro-benzole and oxalic acid.

(Signed.) "JOHN LEIGH, M.R.C.S.L., Medical Officer of Health."

"The Gas Committee. "*Manchester, Aug.* 29, 1878.

"Gentlemen,—Having completed our examination of your accounts for the year ending June last, and found them correct, we have signified the same in the usual manner by signing the various abstracts thereof in your books. (Signed.)

SAMUEL E. COTTAM AND SON."

The expenditure on capital account during the past year has amounted to the sum of £111,124 11s., the particulars of which are given in the summary of receipts and expenditure and in the statement of assets and liabilities. On behalf of the Gas Committee,

JOHN KING, Jun., Chairman.

Gas Offices, Town Hall, Sept. 13, 1878.

PROFIT AND LOSS ACCOUNT.

EXPENDITURE.

To Cannel			£157,040 16 9
Retort men's wages			28,775 13 0
Retorts, materials, and setting			5,407 0 1
Labourers wages and repairs of works—			
Gaythorn station	£6,987 12 2		
Rochdale Road station	10,985 18 3		
Droylsden	155 18 9		
Street-mains	5,418 3 3		
Repairs of hired meters	479 13 1		
		23,127 5 6	
Purifying charges			4,324 15 4
Salaries			11,024 8 2
Collectors poundage, &c.			6,352 0 3
Chief and other rents, rates, and taxes, &c.—			
Chief rents	£146 12 5		
Rates on stations and street-mains	7,017 4 1		
		7,463 16 6	
Income-tax (on account)			1,000 0 0
Carried forward			£244,515 15 7

Brought forward			£244,515 15 7
To Amount transferred to capital account for depreciation of works—			
Gaythorn station—			
4 p. ct. on buildings (£63,214 3s. 4d.)	£2,528 13 4		
5 p. ct. on apparatus (£41,031 12s. 11d.)	2,051 11 8		
Rochdale Road station—		£4,580 5 0	
4 p. ct. on buildings (£111,890 17s. 4d.)	£4,475 12 8		
5 p. ct. on apparatus (£81,755 8s. 9d.)	4,087 15 5		
Droylsden works—		9,063 8 1	
4 p. ct. on buildings (£5769 5s. 7d.)	£230 15 5		
5 p. ct. on apparatus (£5753 1s. 8d.)	287 13 1		
		518 8 6	
Street-mains store (Poland St.)—			
4 p. ct. on buildings (£1369 19s. 1d.)	£54 15 11		
5 p. ct. on apparatus (£360 7s. 6d.)	18 0 4		
Street-mains—		72 16 3	
2½ p. ct. on main-pipes (£237,110 3s. 11d.)		5,927 15 1	
Hired meters and fittings—			
10 p. ct. on £50,276 11s. 0d.		5,027 13 1	
Meter-proving apparatus—			
10 p. ct. on £46 14s. 9d.		4 13 6	
			25,194 19 6
Stationery and advertising			890 8 4
Law expenses, stationery, receipt, postage, and deed stamps			289 18 1
Miscellaneous expenses			1,812 13 3
Clothing for inspectors			413 4 11
Subscriptions to Royal Infirmary and Eye Hospital			57 15 0
Bad debts			700 14 8
Balance carried down			111,594 3 4
			£385,469 12 8
Interest on loans			£15,030 8 5
Ditto on deposits repaid			39 5 9
Amount transferred to capital account towards liquidation of mortgage debt			27,408 18 7
Amount placed to reserve-fund			17,119 5 4
Surplus payable to the Improvement Committee			51,996 5 3
			£111,594 3 4

INCOME.

By Gas-rental—			
Within the city—			
Private consumers	£218,878 6 3		
Meter-rents	3,985 14 11		
Public lamps	14,992 19 10		
		£237,857 1 0	
Beyond the city—			
Private consumers	£76,284 16 0		
Meter-rents	1,795 18 9		
Public lamps	6,594 0 5		
		84,674 15 2	
			£322,531 16 2
Coke			21,535 12 7
Tar			24,458 8 11
Ammonia water			16,943 15 0
			£385,469 12 8
Balance brought down, being the gross profit on the year's working			£111,594 3 4

GENERAL SUMMARY OF RECEIPTS AND EXPENDITURE ON CAPITAL AND REVENUE ACCOUNT.

RECEIPTS.

To Balance in bank, June 24, 1877		£71,591 18 7	
Ditto in treasurer's hands, June 24, 1877		941 15 9	
Ditto of sums owing to and by the Committee, including stocks on hand, June 24, 1877		59,918 9 11	
			£132,452 4 3
Balance of profit and loss account, as per statement			69,115 10 7
Loans received			100,010 12 10
Materials sold (capital account), as per statement			139 12 6
Amount transferred from revenue account—			
For depreciation of works			25,194 19 6
Liquidation of mortgage debt			27,408 18 7
			£354,321 18 3

EXPENDITURE.

By Loans repaid			£20,341 0 9
Improvement Committee—			
Portion of surplus for the year ending June 24, 1877	£51,025 12 1		
Less retained on account of amount advanced in anticipation of profits	8,891 15 10		
		42,133 16 3	
Expenditure on capital account—			
Gaythorn station		£3,876 1 1	
Rochdale Road station		10,317 12 3	
Bradford Road works		58,756 0 11	
Street-mains store		206 4 0	
Street-mains		20,360 9 2	
Service-pipes (one moiety)		1,273 13 0	
Hired meters		11,301 10 11	
Meter-proving apparatus		32 19 8	
		111,124 11 0	
Balance in bank, June 24, 1878		£47,752 18 2	
Ditto in the treasurer's hands, June 24, 1878		185 8 8	
		47,938 6 10	
Ditto of sums owing to and by the Committee, including stocks on hand, June 24, 1878			132,784 3 5
			£354,321 18 3

STATEMENT OF ASSETS AND LIABILITIES.

PERMANENT ASSETS.

Gaythorn station—			
Land, buildings, and apparatus, as per last report—			
Land	£60,467 16 10		
Buildings	63,214 3 4		
Apparatus	41,031 12 11		
		£164,713 13 1	
Less—			
Materials sold	£4 7 9		
Depreciation	4,580 5 0		
		4,584 12 9	
		£160,129 0 4	
One year's outlay to June 24, 1878—			
Experimental apparatus	£99 0 6		
New condenser	1,687 12 1		
Engine and boiler house	345 15 5		
Paving yard	116 13 5		
No. 3 retort-house	67 3 0		
Railway sidings and hydraulic capstans	1,382 3 1		
Purifiers	1,196 13 7		
Boilers	421 18 9		
Stables	88 11 7		
Hydraulic stocking apparatus	3,412 3 4		
Yard mains	58 6 4		
		8,876 1 1	
			£169,005 1 5
Carried forward			£169,005 1 5

Brought forward			£169,005 1 5
Rochdale Road station—			
Land, buildings, and apparatus, as per last report—			
Land	£31,805 4 10		
Buildings	111,890 17 4		
Apparatus	81,755 8 9		
		£225,451 10 11	
Less—			
Materials sold	£135 4 9		
Depreciation	9,063 8 1		
		9,198 12 10	
		£216,252 18 1	
One year's outlay to June 24, 1878—			
No. 2, 3, and 4 retort-houses	£1,606 4 0		
Shops	720 0 0		
Stables	1,222 15 8		
Tramway	2 18 4		
Yard mains	3 13 3		
Exhauster register	42 3 8		
Experimental apparatus	11 2 6		
Purifying shed	111 9 6		
New boilers	1,282 13 4		
Clocks (tower, &c.)	92 10 0		
Meter-house	29 12 9		
Cannel stores	338 10 7		
Hydraulic stoking apparatus	4,848 8 4		
Engine and boiler	6 10 4		
		10,317 12 3	
			226,570 10 4
Droyleden station—			
Land, buildings, and apparatus, as per last report—			
Land	£328 17 3		
Buildings	5,769 5 7		
Apparatus	5,753 1 8		
		£12,351 4 6	
Less depreciation		518 8 6	
			11,832 16 0
Bradford Road station—			
Land, as per last report	£51,699 2 7		
Buildings, ditto	2,911 11 11		
Apparatus, ditto	4,958 6 10		
		£59,569 1 4	
One year's outlay to June 24, 1878—			
Land	£15,713 13 10		
Surveying, levelling, and conveyance	2,451 10 10		
	£18,165 4 8		
River wall	3,967 5 8		
Retort-houses	17,180 0 1		
Canal basin	4,064 0 9		
Gasholder-tanks	4,743 17 2		
Tar wells	3,800 0 0		
Engine and purifying houses	500 0 0		
Railway sidings	3,000 0 0		
Architect's commission	500 0 0		
General construction apparatus	282 10 11		
Temporary work, offices, paving, &c.	2,488 14 3		
Lithography and stationery	35 0 4		
Miscellaneous expenses	29 7 1		
		58,756 0 11	
			118,325 2 3
Street-mains store (Poland Street)—			
Land, buildings, and apparatus, as per last report—			
Land	£1,406 0 0		
Buildings	1,369 19 1		
Apparatus	360 7 6		
		£3,136 6 7	
Less depreciation		72 16 3	
		£3,063 10 4	
One year's outlay to June 24, 1878—			
Stables		206 4 0	
			3,269 14 4
Street-mains—			
Main-pipes, as per last report	£237,110 3 11		
Less depreciation	5,927 15 1		
		£231,182 8 10	
One year's outlay to June 24, 1878		20,360 9 2	
			251,542 18 0
Service-pipes—			
Service-pipes laid, as per last report		£26,001 7 10	
Moiety of one year's outlay, charged to capital account		1,273 13 0	
			27,275 0 10
Hired meters, &c.—			
Outlay, as per last report	£50,276 11 0		
Less depreciation	5,027 13 1		
		£45,248 17 11	
One year's outlay to June 24, 1878		11,301 10 11	
			56,550 8 10
Meter-proving apparatus—			
Outlay, as per last report	£46 14 9		
Less depreciation	4 13 6		
		42 1 3	
One year's outlay to June 24, 1878		32 19 8	
			75 0 11

FLOATING ASSETS.

Cannel, retorts, and other materials on hand		£72,289 17 3
Gas-rents and sundry accounts due to the Committee—		
Revenue account	72,437 16 1	
Extension ditto	50,426 18 1	
Balance in the bank, June 24, 1878	47,752 18 2	
Ditto in the treasurer's hands, ditto	185 8 8	
		243,092 18 3
		£1,107,539 11 2
Excess of assets, June 24, 1878	£511,008 11 3	
Ditto of assets, June 24, 1877	483,599 12 8	
Increase, being the amount charged upon profit and loss for the present year towards liquidation of the mortgage debt, and carried to capital account	£27,408 18 7	

LIABILITIES.

Mortgage—Total amount secured by mortgage	£452,220 8 3	
Sums advanced not secured by mortgage	4,808 6 4	
		£457,028 14 7
Purchase of land, the purchase-money being left in the hands of the Committee at interest		1,750 0 0
Sundry accounts owing—		
Revenue account		32,375 2 7
Extension ditto		11,299 15 7
Deposits in hand		18,695 9 10
Amount placed to reserve-fund, 1877		6,266 6 9
Surplus for the year ending June 24, 1878		69,115 10 7
Balance, being excess of assets		511,008 11 3
		£1,107,539 11 2

GEORGE B. JACKSON, Indoor Superintendent.

[APPENDIX A.]

Statement of the Lamp and Private Rental (including Meter-Rents) derived from Townships within and beyond the City respectively, for the Years 1876-77 and 1877-78.

	Half Year ending Dec. 25, 1876.			Half Year ending June 24, 1877.			Total for the Year 1876-7.			Half Year ending Dec. 25, 1877.			Half Year ending June 24, 1878.			Total for the Year 1877-78		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
Within the city—																		
Township of Manchester—																		
Private rental	71119	14	11	71686	1	2				68864	11	9	65887	15	6			
Public lamps	4097	6	10	3773	1	5				4249	17	6	3859	1	6			
	75217	1	9	75459	2	7				73114	9	3	69746	17	0			
Other townships—																		
Private rental	46315	7	11	45636	12	4				44777	6	2	43334	7	9			
Public lamps	3381	5	4	3410	15	6				3429	18	10	3454	2	0			
	49696	13	3	49047	7	10				48207	5	0	46788	9	9			
Total within the city	124913	15	0	124506	10	5	249420	5	5	121321	14	3	116535	6	9	237857	1	0
Beyond the city—																		
Private rental	39605	18	10	38340	18	9				39620	15	7	38459	19	2			
Public lamps	3129	2	11	3244	13	9				3329	6	7	3264	13	10			
Total beyond the city	42735	1	9	41585	12	6	84320	14	3	42950	2	2	41724	13	0	84674	15	2
Gross rental	167648	16	9	166092	2	11	333740	19	8	164271	16	5	158259	19	9	322531	16	2

Within the city: Gross rental (1876-77) £249420 5s. 5d.; ditto (1877-78) £237,857 1s. 0d.; decrease, £11,563 4s. 5d. Beyond the city: Gross rental (1876-77) £84,320 14s. 3d.; ditto (1877-78) £84,674 15s. 2d.; increase, £354 0s. 11d. Total: Gross rental (1876-77) £333,740 19s. 8d.; ditto (1877-78) £322,531 16s. 2d.; decrease, £11,209 3s. 6d.

[APPENDIX B.]

Comparative Statement of the Quantity of Gas transmitted from the Works, in the Daytime and during the Twenty-four Hours, for the Years 1876-7 and 1877-78.

	Daytime.				Twenty-four Hours.			
	1876-77.	1877-78.	Increase.	Decrease.	1876-77.	1877-78.	Increase.	Decrease.
	Cubic Feet.	Cubic Feet.	Per cent.	Per cent.	Cubic Feet.	Cubic Feet.	Per cent.	Per cent.
July	17,836,000	24,307,000	36·28	....	72,881,900	89,191,000	22·37	....
August	23,392,700	23,603,000	0·898	....	109,270,700	107,529,000	....	1·59
September	25,544,900	27,444,000	7·43	....	127,839,600	139,988,000	9·50	....
October	31,110,000	34,811,000	11·89	....	170,110,100	204,019,000	19·93	....
November	53,517,000	40,216,000	....	24·85	286,478,000	249,454,000	....	12·92
December	50,766,000	53,339,000	5·06	....	268,185,000	289,595,000	7·98	....
January	46,461,000	58,490,000	25·89	....	253,867,000	292,418,000	15·18	....
February	40,246,000	49,242,000	22·35	....	220,987,000	233,067,000	5·46	....
March	45,402,000	38,854,000	....	14·42	217,042,000	193,368,000	....	10·90
April	31,686,000	32,621,000	2·95	....	131,510,000	143,338,000	8·99	....
May	33,477,000	28,233,000	....	15·66	127,832,000	113,214,000	....	11·43
June	23,907,000	23,203,000	....	2·94	84,112,000	87,816,000	4·40	....
Total	423,345,600	434,363,000	2·60	....	2,070,115,300	2,142,997,000	3·52	....

During the daytime (1876-77), 423,345,600 cubic feet; (1877-78) 434,363,000 cubic feet; increase, 11,017,400 cubic feet. During the twenty-four hours (1876-77), 2,070,115,300 cubic feet; (1877-78) 2,142,997,000 cubic feet; increase, 72,881,700 cubic feet.

[APPENDIX C.]

Table showing the Number of each Size of Meters in Use on June 24, 1877 and 1878, respectively.

Size of Meters.	Townships within the City.														Townships beyond the City.		Total.		Increase.	Decrease.
	Manchester.		Chorlton-on-Medlock.		Hulme.		Ardwick.		Beswick.		Cheetham.		Total within the City.							
	1877.	1878.	1877.	1878.	1877.	1878.	1877.	1878.	1877.	1878.	1877.	1878.	1877.	1878.	1877.	1878.	1877.	1878.		
1 light	21	14	8	4	10	6	6	3	..	..	..	..	45	27	16	10	61	37	..	24
2 lights	10823	10516	3588	3528	6502	6348	2551	2524	524	548	1429	1327	25417	24791	9817	9904	35234	34695	..	539
3 ,,	4248	4270	2911	2900	2453	2557	813	800	132	144	1398	1468	11955	12139	5626	6315	17581	18454	873	..
5 ,,	2734	2679	1913	1900	847	871	388	406	47	54	978	1118	6907	7028	3715	4190	10622	11218	596	..
10 ,,	1717	1749	566	605	264	278	137	151	16	19	292	311	2992	3113	1319	1454	4311	4567	256	..
15 ,,	1	2	..	..	..	..	..	..	..	..	..	..	1	2	..	..	1	2	1	..
20 ,,	1041	1050	168	178	114	107	57	71	3	4	66	64	1449	1474	407	443	1856	1917	61	..
30 ,,	466	472	46	44	37	39	14	16	4	5	33	31	600	607	148	154	748	761	13	..
45 ,,	39	33	3	1	2	2	2	2	..	..	..	..	46	38	8	8	54	46	..	8
50 ,,	330	336	17	21	23	27	17	17	2	2	20	23	409	426	100	108	509	534	25	..
60 ,,	127	136	13	14	14	15	2	2	..	..	8	9	164	176	25	28	189	204	15	..
80 ,,	114	119	9	11	12	11	5	5	..	..	1	1	141	147	22	20	163	167	4	..
100 ,,	170	169	10	10	5	6	7	9	1	1	7	7	200	202	48	43	248	245	..	3
150 ,,	52	54	8	7	7	6	5	4	..	..	2	2	74	73	17	18	91	91	..	..
200 ,,	27	23	4	4	3	3	2	1	..	..	3	3	39	34	14	14	53	48	..	5
250 ,,	3	5	..	..	1	..	..	..	1	1	..	..	5	6	1	1	6	7	1	..
300 ,,	18	13	5	5	2	3	..	..	..	..	3	3	28	24	14	19	42	43	1	..
500 ,,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	1	1	..	..
600 ,,	3	3	..	..	..	..	..	..	..	..	..	..	3	3	..	..	3	3	..	..
1000 ,,	1	1	..	..	..	..	..	..	..	..	..	..	1	1	1	1	2	2	..	..
Total	21935	21644	9269	9232	10296	10279	4006	4011	730	778	4240	4367	50476	50311	21299	22731	71775	73042	1846	579

Total increase, 1846. Deduct decrease, 579; net increase, 1267 meters.

Statement showing the Number and Size of Meters on Hire on June 24, 1878 (included in the above Table).

	1 Light.	2 Lights.	3 Lights.	5 Lights.	10 Lights.	20 Lights.	30 Lights.	50 Lights.	60 Lights.	80 Lights.	100 Lights.	150 Lights.	Total, 1878.	Total, 1877.	Increase. 1878.
Within the city	26	15657	7848	3704	1042	267	84	53	22	13	16	1	28733	26631	2102
Beyond the city	7	4471	4511	2610	481	43	8	8	5	1	7	..	12152	10041	2111
Total	33	20128	12359	6314	1523	310	92	61	27	14	23	1	40885	36672	4213

[APPENDIX D.]

Gas-Mains Laid and Taken Up during the Year ending June 24, 1878.

Laid.	Diam. 2 in.	Diam. 3 in.	Diam. 4 in.	Diam. 6 in.	Diam. 8 in.	Diam. 12 in.	Diam. 15 in.	Diam. 18 in.	Diam. 24 in.	Diam. 30 in.	Total Length.	Remarks.
	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	
Townships within the city—												
Manchester	1362	503	476	100	208	..	..	..	..	1127	3776	
Hulme	485	440	..	36	..	..	..	..	..	..	961	
Chorlton-upon-Medlock	648	1196	18	..	..	..	..	..	..	..	1862	
Ardwick	237	122	..	..	..	..	..	..	..	..	359	
Cheetham	817	734	288	12	..	..	..	..	..	..	1851	
Beswick	555	112	..	..	..	..	..	..	..	..	667	
Townships within the city	4104	3107	782	148	208	..	..	..	..	1127	9476	Yards laid— Within the city.
Townships beyond the city	8886	9767	3428	1124	880	268	36	597	147	1484	26617	Beyond the city.
Total	12990	12874	4210	1272	1088	268	36	597	147	2611	36093	During the year.
											Being 20 miles and 893 yards.	
Taken up.												Yards taken up—
Townships within the city	544	200	74	..	38	..	..	9	..	..	865	Within the city.
Townships beyond the city	1576	368	692	41	..	36	..	..	..	..	2713	Beyond the city.
Total	2120	568	766	41	38	36	..	9	..	..	3578	During the year.
											Being 2 miles and 58 yards.	
Laid during the year 1877-78	12990	12874	4210	1272	1088	268	36	597	147	2611	36093	
Taken up during the year 1877-78	2120	568	766	41	38	36	..	9	..	..	3578	

Net increase during the year ending June 24, 1878 . . . . . 32,515 yards. Total net increase during the year . . . . . 18 miles and 835 yards.

[APPENDIX D—*continued.*]

Summary.

	Diam. 2 in.	Diam. 3 in.	Diam. 4 in.	Diam. 5 in.	Diam. 6 in.	Diam. 7 in.	Diam. 8 in.	Diam. 9 in.	Diam. 10 in.	Diam. 11 in.	Diam. 12 in.	Diam. 13 in.	Diam. 14 in.	Diam. 15 in.	Diam. 16 in.	Diam. 17 in.	Diam. 18 in.	Diam. 20 in.	Diam. 22 in.	Diam. 24 in.	Diam. 30 in.	Total Length
Pipes laid to June 24, 1877—	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.
Within the city. . .	259530	125163	51355	14758	31628	738	15323	13486	1456	279	29619	309	7222	4978	3993	55	5811	324	477	6799	2576	575879
Beyond the city. . .	151401	66436	54732	6594	32267	410	27937	13713	1327	1808	21140	..	749	305	..	..	4031	..	..	315	939	384104
Pipes laid during the year ending June 24, 1878—	410931	191599	106087	21352	63895	1148	43200	27199	2783	2087	50759	309	7971	5283	3993	55	9842	324	477	7114	3515	950983
Within the city . . .	4104	3107	782	..	148	..	208	..	..	..	..	..	..	..	..	..	..	..	..	..	1127	9476
Beyond the city. . .	8886	9767	3428	..	1124	..	880	..	..	..	268	..	..	36	..	..	597	..	..	147	1484	26617
	423921	204473	110297	21352	65167	1148	44345	27199	2783	2087	51027	309	7971	5319	3993	55	10439	324	477	7261	6126	998076
Deduct pipes taken up up during the year .	2120	568	766	..	41	..	38	..	..	..	36	..	..	..	..	..	9	..	..	..	..	3578
Total	421801	203905	109531	21352	65126	1148	44310	27199	2783	2087	50991	309	7971	5319	3993	55	10430	324	477	7261	6126	992498

Total, 992,498 yards, or 563¾ miles and 298 yards.

[APPENDIX E.]

Statement showing the Amount of Gross Profit, and the Mode of its Appropriation; also the Amount of Borrowed Money Owing, and the Excess of Assets, &c., from the Year 1862 to the present Date.

Year ending June 24.	Profits.	Maximum Price of Gas, per 1000 Feet, within the City.	Appropriation of Gross Profits.			Amount advanced to Improvement Committee in anticipation of Profits.	Paid over for Improvement Purposes.	Retained towards Repayment of Advances made to the Improvement Committee in anticipation of Profits.	Carried to Reserve-Fund to meet future Contingencies.	Balance owing of Amounts advanced in anticipation of Profits.	Borrowed Money Owing.	Amount charged to Revenue in respect of Depreciation of Works and Mains.	Excess of Assets.
			Interest.	Liquidation of Mortgage Debt.	Surplus.								
	£ s. d.	s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1862	42667 7 1	4 0	15482 3 2	19330 14 4	7854 9 7	....	7854 9 7	....	....	....	382539 7 10	12179 4 11	126591 4 6
1863	55804 12 9	Half year 4 0 / „ 3 9	14932 17 8	18609 17 4	22261 17 9	....	22261 17 9	....	....	....	362877 8 10	12666 18 11	145201 1 10
1864	59545 18 9	Half year 3 9 / „ 3 6	13388 12 10	17810 1 0	27847 4 11	....	27847 4 11	....	....	....	335808 16 9	12690 12 9	163011 2 10
1865	56432 4 5	Half year 3 6 / „ 3 2	13086 10 9	17587 0 11	25758 12 9	....	25758 12 9	....	....	....	306951 2 2	13050 6 6	180598 3 9
1866	52553 2 10	. . . . 3 2	13252 13 0	19784 2 0	19516 7 10	....	19516 7 10	....	....	....	347472 2 11	13817 2 9	200382 5 9
1867	47323 0 4	. . . . 3 2	14167 11 7	19898 0 4	13257 8 5	....	13257 8 5	....	....	....	331725 9 7	14628 8 6	220280 6 1
1868	49546 4 7	. . . . 3 2	14314 17 9	20246 0 5	14985 6 5	13059 8 5	28044 14 10	....	....	....	351035 10 4	15173 2 5	239085 15 6
1869	52736 18 4	. . . . 3 2	15467 12 6	22688 14 4	14580 11 6	11303 19 8	25884 11 2	....	....	24363 8 1	395469 8 5	15387 15 7	262374 9 10
1870	65343 10 8	. . . . 3 2	16784 13 8	24487 6 0	24071 11 0	3750 0 0	27821 11 0	....	....	28113 8 1	432941 1 9	17633 5 10	286861 15 10
1871	79322 9 5	. . . . 3 2	18329 0 5	27050 15 11	33942 13 1	....	28020 11 11	5922 1 2	....	22191 6 11	448593 9 5	19602 10 5	313912 11 9
1872	68257 9 7	. . . . 3 2	18539 19 6	27805 15 11	16911 14 2	13293 10 3	30205 4 5	....	....	35484 17 2	459593 9 5	22283 6 8	341718 7 8
1873	63603 0 6	One qr. 3 2 / Three „ 3 4	18413 7 1	28588 19 6	16600 13 11	16641 11 6	33242 5 5	....	....	52126 8 8	460640 11 0	22614 18 6	370307 7 2
1874	77405 12 2	Half year 3 4 / „ 3 8	18861 13 3	28977 9 6	29626 9 5	183 9 4	29809 18 9	....	....	32309 18 0	457834 5 0	22849 4 5	399284 16 8
1875	106807 6 5	. . . . 3 8	17182 18 8	28514 17 11	61109 9 10	....	35257 2 1	25852 7 9	....	26457 10 3	432310 2 0	22908 7 0	427799 14 7
1876	101222 4 6	Half year 3 8 / „ 3 6	16185 10 8	28070 2 5	56976 11 5	....	39410 17 0	17565 14 5	....	8891 15 16	405562 14 1	23491 15 7	455869 17 0
1877	100539 16 7	Half year 3 6 / „ 3 4	15518 2 1	27729 15 8	57291 18 10	....	42133 16 3	8891 15 10	6266 6 9	....	377359 2 6	24021 13 9	483599 12 8
1878	111594 3 4	Half year 3 4 / „ 2 0	15069 14 2	27408 18 7	69115 10 7	....	51996 5 3	....	17119 5 4	....	407028 14 7	25194 19 6	511008 7 3
Tot.	1185775 2 3	....	269477 18 9	404588 12 1	511708 11 5	....	488322 19 4	....	23385 12 1	....	....	310193 14 0	...

WARRINGTON CORPORATION GAS SUPPLY.

At the Monthly Meeting of the Warrington Town Council, on Tuesday, the 1st inst.—the MAYOR (Mr. J. Fairclough) in the chair—the Gas Committee reported that, at their meeting on the 20th ult., the following report by the Engineer of the Gas-Works (Mr. James Paterson), on the extensions which were necessary, was read, its consideration being deferred:—

Gas-Works, Sept., 1878.

Messrs. the Gas Committee.

Gentlemen,—I beg very respectfully to report to you that an early extension of your gas-works is urgently necessary to meet the rapidly increasing demand for gas.

Your present works were laid out to give a producing power of 130 million cubic feet per annum, and that measure is now filled up. The property purchased by the late Gas Company was utilized to the best advantage for manufacturing purposes, and every portion of the respective apparatus balanced to the maximum generating power. The ground is full and properly occupied, and the works as a whole are complete.

Any attempt to do more on the present site would not be desirable, as the greatly increased demand for gas has outgrown the delivering power of your mains, and requires that an undue pressure be maintained at the works for the purpose of keeping up an adequate supply of gas. To correct this deficiency would be attended with great expense, as outlet-pipes in the gasholder-tanks, the governors on the works, and great lengths of the street-mains would be required to be removed, and replaced with larger.

Suppose, however, these alterations to be made, it would only involve you in greater difficulties, as you have no means of increasing the supply which the increased consumption of gas would require. It is therefore necessary that another course should be adopted. In the case of an important and growing town like Warrington, it would, in my opinion, be a useless expenditure of capital at the present time to provide for your immediate wants only. In the interests of the Corporation, I would recommend that a comprehensive view of the matter be taken, and to provide accommodation in the acquisition of land to carry you over a period of about 20 years. This will doubtless prove the most economical and profitable in the future of your undertaking.

As a general rule, the increase in the consumption of gas in manufacturing towns doubles itself, or nearly so, every ten years. In your own case the following figures show the increase in each decade for the last 30 years, which you will observe goes on in a geometrical ratio, viz.:—

Year.	Annual Make of Gas.	Increase.
1847	16,132,000 . . .	—
1857 (1st decade).	35,809,000 . . .	19,677,000
1867 (2nd decade)	67,397,000 . . .	31,588,000
1877 (3rd decade).	128,284,000 . . .	60,887,000

As we have no reason to suppose the increase will be less in the future progress of Warrington, a site for the erection of new works is indispensable. These, in the meantime would take the form of supplementary work; but in course of time will become your chief and most important station. From these works a large trunk main would be carried into the town, having branches right and left for distributing an ample supply of gas at a low pressure. This will obviate to a considerable extent the necessity of opening the streets for a general redistribution of the mains, which otherwise would be necessary, and will, I anticipate, result favourably in reducing the per centage of unaccounted-for gas which of late years has increased from 10 to 13½ per cent.

I need not say to you that a railway siding in connection with your contemplated works would be a benefit to the Corporation.

(Signed) JAMES PATERSON, Manager.

At the adjourned meeting of the Committee, held on the 27th of September, it was resolved that the Town Clerk be instructed to communicate with the London and North-Western Railway Company, and ascertain if they will introduce a siding into the 16 acres of land adjoining their railway and the Longford Wire Iron and Steel Company's land in case the Corporation take the land for the purposes of the gas-works.

Alderman HEPHERD, in moving the adoption of the report, said that it had been fully considered by the Committee, and the facts stated were no doubt the true ones, and would have to be acted upon. It was well known from statistics that, in towns such as Warrington, the progressive increase in the consumption of gas was that every ten years the consumption about doubled itself, and this had been the case with the consumption of gas in Warrington. Therefore, if provision was to be made for the consumption for the next 20 years, as Mr. Paterson advised, the make being now about 130 millions, and the works occupying land of about 5 acres in extent, by the year 1897, according to the progress already made, about 500 million feet of gas per annum would be required in Warrington. And according to the manufacture by the works, which now occupied about 5 acres of land, about 20 acres would be needed to produce the amount of gas which would then be required. For some weeks the Gas Committee had been on the look-out for a suitable site for the purpose of erecting new works. The land which had been selected was thought to be the most desirable, being bounded by the London and North-Western Railway, and he was told that arrangements had been partly made to sell it at a certain price, subject to one or two little circumstances, which he had no doubt would be arranged. The site had many advantages, inasmuch as he did not suppose that anybody in the neighbourhood, at all events of those houses sufficiently near, would raise the least objection to having gasholders in the neighbourhood. It was laid down by Act of Parliament that notice must be given to every person living within 300 yards of the place where it was intended to make gas, for the purpose of giving them an opportunity of objecting. This site was in such a locality that he did not think there would be one objection from the half dozen houses which happened to be within 300 yards of the proposed works. It would suggest itself, he thought, to every member of the Council, that the plot of land was an exceedingly suitable one for the purpose, and when the price was named for which the land could be purchased—or had been purchased, in fact—he did not think the Council could complain as to the amount. He did not know that there was any secret in the matter, inasmuch as there was no large amount at stake. The Committee would have to deal with the London and North-Western Railway, and would want a siding on to the land, which would be a great advantage to the works, inasmuch as it would enable the coals required to be run direct from the railway to the spot where they would be used.

Alderman HOLMES seconded the motion.

Mr. MONKS said he did not want to object to the minutes, but he thought the Committee ought fully to consider the utility of the electric light, which, he believed, was the light of the future, and would very soon become applicable for either towns or large works. In forges it would

be especially an advantage, as it could be worked by the existing steam machinery at comparatively little cost.

Mr. LEA expressed his surprise that the Council should already be talking of making very serious enlargement of the gas-works, when one of the great arguments of the promoters of the purchase of the works was that they would be able to supply the town for some time to come.

Mr. BARLOW agreed with Mr. Lea, and further thought, with Mr. Monks, that the electric light should be carefully considered, and that, under any circumstances, the matter ought not to be dealt with before the 1st of November.

Alderman CHANDLER suggested that the report of Mr. Paterson should be printed and circulated, for the purpose of giving information.

Mr. J. HARRISON hoped the report would not be hastily adopted, and thought it was rather refreshing to hear Mr. Monks advocating the electric light, as during the opposition to the purchase of the gas-works that gentleman entirely ridiculed the idea of the electric light ever becoming an opponent to gas.

Alderman WEBSTER said that during the canvass for the promotion of the gas-works purchase it was well known, and particularly impressed upon the minds of the ratepayers, that the consumption of gas doubled itself every ten years. It was likewise impressed upon them that before very long there would naturally have to be an increase in the works, and that every ten years they might expect a similar increase to be found necessary. The time for an increase had now arrived. Several years had elapsed since the works were enlarged, and, as some time would also elapse before the new works could be got into order, this was the time to set about the task. At present there was no reason to complain of the results of the purchase, inasmuch as there was a surplus of something like £2000 over the expenses, and this might be expected to increase. It was necessary to take steps now for enlarging the works, as it would be twelve months before they could get a Bill in Parliament passed; and then, as he had already mentioned, there would be a considerable interval between the passing of the Bill and the completion of the works. With regard to the electric light, it had been very fully considered by Mr. Paterson, and he had reported verbally to the Committee on the subject. If Mr. Monks had been present at the Committee meeting, he thought that he would have been satisfied with what Mr. Paterson had said. It was to the benefit of the town that the extension of the works should be proceeded with.

After some further discussion, and Alderman HEPHERD having replied, the minutes were put to the meeting and carried.

NORTH OF ENGLAND GAS MANAGERS ASSOCIATION.

The Ordinary Half-Yearly Meeting of this Association was held at Carlisle, on Saturday, the 5th inst., when there was a large attendance. Mr. J. HEPWORTH, of Carlisle, the President of the Association, occupied the chair.

The minutes of the last meeting having been confirmed, the following new Members and Associates were elected:—

Members.

Arkless,	Gas-Works,	Durham.
Rutter, S.	„	Brampton.
Shaul, E.	„	Penrith.

Associates.

Burn, J. H.	Coalowner	Newcastle-on-Tyne.
Cameron, A.	Coal Merchant	Glasgow.
Clapham, R.	Sulphate of Ammonia Manufacturer	Sunderland.
Haswell, G. W.	Engineer	Newcastle-on-Tyne.
Scott, A.	Gas-Works	Galashiels.
Stewart, S.	„	Greenock.
Young, J. R.	Coalowner	Newcastle-on-Tyne.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—My first duty in assuming the chair this morning is to thank you for the honour conferred upon me, at your last meeting in Newcastle, by electing me to the office of President of this Association for the current year. I assure you that I appreciate this expression of your good opinion, and while I feel that it arises much more from your generous esteem than from any merits of my own, I can only hope that I may be able so to discharge the duties of the office as not to tax unduly the generosity you have thus extended to me.

We have entered upon the second year of our existence as a District Association of Gas Managers, and I congratulate you upon the remarkable growth attained in so short a period. Already we had on our roll 41 Members and 19 Associates, and you have been asked to increase this number to-day by the addition of 3 Members and 7 Associates, thus making in all a total of 70. But prosperity does not consist in mere numbers. It is by the work of this Association, the character of its papers and discussions, that its prosperity and usefulness will be measured, and its existence justified. To be successful in the highest degree, this Association must not only have a large membership and efficient funds, but must also gather within it the best men in the district to assist in its active work.

Meeting as we do to-day for the first time in Cumberland, and in the presence, probably, of some who are unacquainted with our Association, I may be allowed to refer briefly to the objects we have before us. To some, indeed, the question may arise, What need is there for an Association at all? My reply briefly is, that by the aid of an Association of this character much may be done to acquire and to circulate information relating to the manufacture and distribution of gas, that could not possibly be done otherwise.

The necessity of such Associations has been felt, and acted upon, not only in the case of the British Association of Gas Managers, but in other District Associations similar to our own; and in other professions also.

The objects of this Association are "the advancement of gas engineering and the encouragement of dicussions of all matters connected with the manufacture and distribution of gas and its products."

In promoting these objects, there is no room for mere personal display, or for the promotion of merely personal ends in any shape. We seek the growth and prosperity of our staple industry, by the diffusion of knowledge among ourselves. The advantages of this Association will, I trust, be made increasingly evident at every successive meeting, but in addition to those of a more important character already referred to, it must be apparent to every member of the Association that one great advantage these Associations have already secured is the removal of that sense of isolation formerly experienced by most gas managers, and with it that feeling almost approaching to jealousy which once existed between managers of different gas works. At this day there is not only a friendly feeling, but a generous interest taken in each other's work, and a disposition to counsel and help others, where this is possible.

I hope that the practice of holding our meetings in different towns will be continued, for from that practice I anticipate the best results. In a district sparsely populated, as is Cumberland and Westmoreland, the manager of small gas-works has comparatively very few opportunities of seeing and hearing what is being done in other and larger works than his own, and it is therefore obviously to the advantage of the persons of a district when these meetings are held in their vicinity.

In this Association we have not as yet done much more than produce papers for reading and discussion, and I congratulate you that to-day we are again to have as many papers as our time will permit us to receive. But it seems to me that this Association might extend its usefulness in several ways. I am informed that in each of the several cantons of Switzerland there is a public museum in which, among the local objects of interest, a collection of the minerals of the district, with their chemical analyses, is exhibited. Lacking as we do in this much wealthier country the advantages of such museums, except in comparatively few places, why should not this Association become—though in a more restricted way—the repository of similar information respecting the minerals or manufactured products peculiar to the district, and especially those of any service in the manufacture of gas? But should this be impossible, why not appoint, as a paid officer of the Association, a competent physicist, whose duty should be to report upon such matters as were submitted to him for that purpose? Then there are facts in connection with our daily work and experience which, if collated, might form valuable data for future use; as, for instance, a tabulated statement relating to the carbonizing of coal, giving dimensions of ovens, retorts, and furnaces, and the work performed per retort per day, the dimensions of ascension and dip pipes and the hydraulic main, the cost of labour and fuel, and other matters. Also one on the condensation and purification of gas, and the several forms of apparatus employed, with their relative cost and efficiency. In these directions, and in others, it would surely be possible to form a series of statistical reports of the utmost practical value. To assist us in arriving at a thorough knowledge of what we are actually doing, and for the purpose of comparison with others, what could be more desirable than one uniform system of accounts and balance-sheets, and a complete analysis of the accounts on the plan adopted by Mr. Field in the case of the Metropolitan Gas Companies accounts. There are yet other ways by which this Association might extend its usefulness—by co-operating with gas companies and corporations in the occasional publication of information relating to the economical use of gas for lighting, heating, and motive power. It would often be of real service to publish such facts, respecting the products of combustion and the atmosphere of rooms, as were brought out in the evidence given before some of the Parliamentary Committees of 1877, and in the more recent lecture by Mr. T. Wills, F.C.S., on "The Products of Combustion." On all these subjects, gas consumers are in much need of information, and I believe they would welcome it. A public lecture on some of these subjects might certainly be attempted on the occasion of our meeting in a town for the first time, and on such an occasion an exhibition of gas apparatus would also be an object of interest to the public, as has already been demonstrated in several instances.

But although this Association should succeed in accomplishing everything it attempted, it is by no means certain that managers of gas-works would themselves succeed in reaching the professional standard of the future—for this is a progressive age, and even an examination age, and we need not be surprised if we hear the tide of examination approaching us. My predecessor, whom we all welcome to-day as the President of the parent Association, referred, in his Inaugural Address, to the desirability of forming an Institute of Gas Engineers, to be open only to those whose professional attainments were indisputable, such Institute not to interfere with the scope of the District Associations, which, in their way, might become so many technical schools, through which members might pass to the Institute; and, more recently still, our attention has been called to the necessity for the more thorough preparation of those who are seeking positions in the profession of gas engineering.

There can be but one opinion as to the desirability of every gas engineer keeping abreast with the progress of the times. There have always been some in our ranks who have not only been distinguished by their eminence as gas engineers, but by their general attainments in physical science. There are others who, having had but few opportunities of acquiring knowledge honestly, make no pretensions beyond those of faithfully striving to discharge the duties of their several positions according to the best of their ability.

In these respects the position of our profession does not differ from that of some others. It is suggested, however, that for the future an examination in certain technical subjects is desirable before the manager of gas-works can take his place as a member of the proposed Institute of Gas Engineers, and, by this and other agencies, steps be taken to raise the standard of proficiency throughout our ranks. Is this desirable? Is it the case in similar professions? But if for no other purpose than that of guiding pupils and others in the choice of their special studies, I can readily believe that such an examination would be beneficial, and I should not regret to see the suggestion carried out. But how is this to be done? If you will refer to the proceedings of the Society of Arts for recent years you will find that that Society has already carried out such examinations, and in the programme of examinations for 1878 "The Technology of Gas Manufacture" again holds a prominent place; and that one of the Past-Presidents of the British Association of Gas Managers occupies the honorary position of Examiner. We are indebted to the Society of Arts for many valuable lectures bearing on our special work, and not less so, in my judgment, for instituting these examinations, the value of which may be seen when it is remembered that they include, in addition to the technology of gas manufacture, the following subjects, viz.:—Practical Plane and Solid Geometry; Machine Construction and Drawing; Theoretical and Applied Mechanics; Acoustics, Light, and Heat; Inorganic Chemistry.

These are the subjects, then, and there are several who have already passed in them. It is well that this demand for higher attainments comes from within, and not from without; from persons actively engaged in gas-works, not from directors or shareholders of gas-works; and in that fact we may see, I think, what the results of the movement are likely to be. The lines are already laid down for us, and it should not be a difficult matter for the parent Association to take some action in the matter; but, when that is done, I anticipate that these District Associations will be called upon to take part in fixing the details, and that is my reason for introducing this subject to-day. If this movement is to go forward in the direction indicated, it would be much better that it should be undertaken by the British Association; but if it should be found impracticable, the examinations of the Society of Arts are still available.

I fear it would be too much to expect, even when larger numbers have thus qualified, that gas companies or corporations will always appoint as engineers and managers of their works those who can show such good credentials of their education—other questions than those of fitness too often decide these appointments. But we must not overlook the fact that, however successful a candidate might be in passing technical examinations, this alone would not fit him for the management of gas-works. Engineering skill, chemical manipulation, commercial knowledge, business habits, firmness of character, tact, urbanity, all have their place in the qualifications of the successful manager of gas-works.

Possibly the thought has already arisen in your minds that, by the time

all these qualifications for the position of gas manager have been attained, it is probable there will be no gas-works to manage; that the era of gas lighting will have been succeeded by electric lighting.

I have never been one of those who seemed to scorn the idea that the electric light could ever come into competition with coal gas; but I see no immediate probability of any extensive competition. Many of you have seen the great display of the electric light in Paris this year, and so much has been lately written on the subject in the Press, that it is not necessary for me to describe either the light or the several electrical machines by which it is produced. I had hoped, however, to put before you such further facts as would have enabled you to form some opinion of the general adaptability and cost of the electric light now in use, and I have made some effort in this direction, but, I regret to say, with less success than I could have desired. I am obliged, therefore, to base my remarks, to some extent, on the observations of others.

Of the several electrical machines invented, the one most recently introduced into this country is that of M. Lontin; and as this is the only one I have seen at work, I may here say, in parenthesis, that the light given off is intensely brilliant, immensely superior to that of gas, both in strength and quality, and is generally steady and uniform. In its present form it is certainly unfit for domestic lighting; but with some modifications it may possibly be made available, some time in the future, for lighting streets, and for large buildings not divided into small compartments. The first difficulty in the way is that of its distribution. An intense light at one or more points may be a desirability in the case of a lighthouse, but it is an objection when light requires to be diffused; and a large number of machines, and the constant personal attention required, are inconveniences which, quite irrespective of cost, must be disposed of before the electric light can seriously compete with gas, even in street lighting, and much more so in the case of domestic lighting.

But another objection has been raised to the domestic use of the electric light. The ratio of the power between the electric light and the sun is said to be about 7 to 6. With such an intense glare of light as this, in an ordinary-sized sitting-room, our very sight would be endangered. But on this point Mr. Lewis Thompson, M.R.C.S., in a most interesting letter on the subject, has given a very decided opinion. He says that "such a light is altogether unfit for domestic use;" and, if ever it is generally adopted, he predicts that cases of amaurosis and cataract will be numerous.

If it should be replied that these objections to the electric light are somewhat problematical, then, on, the other hand, it may be said that so, at least, are some of its alleged advantages.

It has been stated that the electric light can be produced at half the cost of coal gas. I ask, Where? If in America, the price of gas at Washington (if I am rightly informed) is 12s. per 1000 cubic feet; if in France, the price of gas in Paris is 7s. per 1000 cubic feet; if in England, the price of gas is 3s. 2d. per 1000 cubic feet.

But, on the point of cost, it is but fair to point out that opinions differ. Mr. Stayton, the Surveyor to the Chelsea Vestry, made a special visit to Paris, to enable him to report to his Vestry on the subject, and I quote his opinion the more readily as he is not connected with gas-works. Referring to the Jablochkoff light, he quotes the statement of the City Engineer of Paris, "that the cost of the electric light is four times that of gas, but a greater amount of light is obtained;" and quoting the Chelsea Embankment as a local illustration, Mr. Stayton states that "to light the Chelsea Embankment, which is about 1530 yards long, and has 109 gas-lamps, would require a first outlay of £4800 for 48 lights of 3250 hours per annum, with an hourly cost of £1 4s. The present cost of the gas-lamps is 2s. 1½d. per hour for 3850 hours per annum."

Mr. Hollingshead, who has introduced the Lontin light into this country, says that "the light could be supplied to light an area of 1540 yards long by 44 yards wide, with 36 lamps, such as are in use at the Gaiety Theatre, having an illuminating power equal to 2000 of the existing lamps, at a cost of 10s. 6d. per hour for consumption and superintendence. Thus in place of 109 gas-lamps, the public would get a lighting power nearly 20 times greater, at a cost only five times greater than the present outlay." I have no means of testing these statements, but, taking them as they stand, you will, I think, come to the conclusion that on the ground of cost as well as on the ground of adaptability, much yet remains to be done before the electric light encroaches on the domain gas has so long held. Difficulties, however, are but spurs to an inventor, and though the electric light in its present form is unsuited for general use, it may possibly be that some invention of the future may succeed in bringing it into active competition with coal gas.

I am inclined, however, to think, with Dr. Siemens, "that each light has its separate circle, and that these circles will rarely, if ever, coincide."

I was much interested in reading the other day a report of a speech by M. Fontaine, of Paris, the Engineer of the Gramme Company, and Author of an excellent treatise on electrical illumination. Speaking on this subject at the last meeting of the London Institution of Mechanical Engineers, M. Fontaine says: "The electric light does not interfere with gas light, nor with oil light, nor with candle light. It will not revolutionize, as has often been averred, the question of lighting, destroying what is now in use, and monopolizing every industrial application, domestic and public. The electric light has its place marked out for it under many circumstances; but far from diminishing the consumption of the other lights, it will lead to their further development by demonstrating the advantages of a more powerful and complete illumination."

After such statements on the part of those who are so competent to advance them, I think we may dismiss from our minds any fears about the extinction of gas-works, and should the time ever come when all the streets, squares, stations, and manufactories of our towns are lighted by the electric light, the decrease in the consumption of gas would not be more than 25 per cent. or 30 per cent. in most cases, but even this might be more than compensated for by the increased consumption by gas-engines, which would probably be used for working the electrical machines. In prospect of even possible competition, let us, in our several works, go on doing what we can to cheapen and still further improve the gas we supply.

It has often been a subject of regret with me that, as managers of gas-works are generally situated, it is impossible for them to undertake much in the way of original investigation, and, indeed, do little more than attend to the ordinary routine of duties. This is very much to be regretted in the manager's own interests, but more in the interests of those he serves. New knowledge is scarce, and second-hand knowledge has, therefore, to be taken, and sometimes too much relied upon. It must be obvious, however, that he who, while fully availing himself of the literature of his profession, and the experience of those who have preceded him, can also find opportunity for physical research, and can experiment for himself in matters relating to the production of artificial light, is much more likely to discharge his duties with satisfaction and advantage to his employers.

There are some valuable endowments in this country; but the endowment of research is not an extensive one. I do think, however, that companies and corporations owning moderate-sized gas-works might follow with advantage the example of the Paris Gas Company, by devoting sums of money from their profits annually for purely experimental purposes, and that, in large works, nearly the whole time of at least one officer might be advantageously occupied in this way.

Until the experimental age arrives, we must welcome from any source any suggestion that contributes to the purity or cheapness of gas.

The further purification of gas appears to be the most desirable thing remaining to be accomplished, not so much because the products of combustion of coal gas are so injurious as some persons would have us believe, but because it is desirable to remove even the last ground of objection to the use of gas. If the carbon bisulphide at present remaining in gas is even only theoretically objectionable, our best efforts should be given to remove it.

Important advances towards this have been made in recent years, and I have good reason for saying that success seems well within our reach.

Gentlemen, I thank you for having listened to me for so long a time. I will only detain you further by saying that the city in which we are met to-day possesses objects of much greater attraction than its gas-works. The Cathedral and the Castle are well worthy of your inspection before leaving. I trust your attendance to-day may long remain as a pleasant memory, and also that, as its result, every member will feel himself impelled to fresh efforts to further the prosperity of gas undertakings.

Mr. W. J. Warner (South Shields) moved a vote of thanks to the President for his valuable address, which was seconded by Mr. J. H. Cox (Sunderland), and carried unanimously.

Mr. W. Ford (Stockton-on-Tees) then read the following paper on

TANK TRAMMELS.

This is a subject upon which comparatively little seems to have been written, considering its great importance, and the numerous methods now in use; for the more or less correct construction of circular tanks are, in many cases, the invention or improvement of each individual engineer, and suited, perhaps, only to his individual wants. My purpose, in introducing the subject specially to your notice, is not so much to enumerate the various ways in which a true circle of considerable diameter may be described, for the guidance of excavators and builders engaged on a work requiring not only a true radius at any one specific point or level, but a radius from which work can be gauged to any required depth, as to elicit discussion on a matter of so much importance to the members forming our Association. It will be readily granted that there exists every necessity why a gasholder-tank should not only be set out truly and correctly at its base, but be as accurately built from there to the top; and it is evident that to do so it is advisable to use the same gauge throughout the operations, and use it as frequently and continuously as practicable. In the case of tanks of small diameters, the construction of a suitable trammel is not a matter of so much difficulty, for a reasonably good circle may be described by a trammel of the required size, formed from wood, and put together in the way best answering the strengths of the material used. Such a trammel, worked in conjunction with short sweeps of timber cut on one side to the radius wanted, may complete a circle true enough for the end desired; but in the case of larger tanks, where, in the event of wood being used for a trammel, the material in itself would be needed of so heavy and unwieldy a size, and its stays and struts of proportionate strength, in order to overcome the sag or spring natural to the timber, the matter is one of more difficulty. It is, therefore, better that the larger-sized trammels be constructed of light irons, stayed and trussed where necessary, and furnished at the one end with a sliding tube or tubes, acting with a telescopic motion, whereby the length of radius may be increased or diminished at will, and adjusted, where and when required, to describe the sweep or sweeps wanted, and at the other end fitted with a counter-balance calculated to equalize the weight on its pedestal, and contribute a steady and even motion to the radius when moved from point to point as desired. I submit herewith a sketch of such a trammel, which I had constructed many years ago. It is capable of describing circles varying from 60 feet to 122 feet in diameter, and with slight alteration to 140 feet in diameter. The two wrought-iron flats forming the sides are specially rolled in one length each, and are stayed together and strengthened by the zig-zag 2½ inch by ¼ inch flats, which are rivetted to each plate. At the extreme end there are three pieces of flat iron placed at equal distances apart, and bent and bolted to the side plates, and each of these three has a hole in its centre, through which passes the end of the tubing forming the telescope. At the opposite end is a strong bolt, from which hangs a hook to receive the "cleek," by which are suspended the balance-weights, as shown. The two upright plates are bolted to the sides, and between them, at the heights marked, are bolted two bushes which work on turned collars shown on the column. At the top, the two vertical plates are bolted together with a strong bolt, which is square between the plates, and receives the two longest stays, the one end of each stay passes through an eye in this bolt, and is there secured with nuts, the other end stretches to near the extremity of the side plate, and is bolted to the outside of it. The other pairs of stays are bolted in a similar way to the side plates, and are furnished at the other end with an eye, through which passes the top bolt, securing them with nuts, as shown. The column is made of cast metal, and has in its base-plate four holes to receive holding-down bolts to secure the trammel in its position. In using this trammel it has been my custom to first of all complete the construction of the centre pillar of the tank, and upon it bolt down the trammel bed-plate, with the four bolts, to a bed-plate specially built in a pillar for that purpose. To the top plate the column of the trammel is, of course, bolted down, and the trammel arranged and balanced for work. The tubing is drawn out or pushed in as required, and is secured at any required length by means of set screws and pins. From the extreme end of the smaller tube there hangs a plumb-bob, which may be raised or lowered as required by means of a cord attached to it for that purpose. With this instrument the same unvarying circle is preserved from bottom to top all throughout the building operations, the bricklayers merely needing to move the point of the trammel (by means of a light guy) round to wherever it may be wanted, adjust the plumb-bob to the height desired, and continue their work without interruption. For tanks of a larger or smaller diameter it is only necessary to fix the length of the arms to what distance is wanted, and this is easily and readily done by pulling out or closing up one or both of the telescopic tubes, and securing them, when at their correct length, with the set pins. When each tank is completed the trammel is easily taken to pieces, and removed from its place to where it may next be wanted, and the cast-iron plate used for securing it on the top of the centre pillar will serve in place of stonework, which might otherwise be placed to receive the gasholder centre-pipe. It will easily be believed that the work constructed by the use of such a trammel, or one of a similarly truthful nature, is much more accurately, more regularly, and more reliably built than where cruder forms, or less trustworthy materials, are adopted to fulfil the purpose. By its use is also saved much time and money, and the extra work which not unfrequently falls to the lot either of the tank contractor in chipping and plumbing his walls, or of the gasholder contractor in cutting and paring his carriages and wheels to suit the inequalities of an irregularly-constructed tank.

Mr. J. Whyte (Seaham) said he had used Mr. Ford's trammel in the

construction of a large tank, and found it answer admirably. There was not ¼ inch variation between the top and the bottom of the tank.

Mr. Ford, in reply to Mr. H. Tobey (Malton), said the cost of the trammel would be £12 10s.

Mr. C. Sellers (York) read the following paper on

THE ADVANTAGES TO GAS COMPANIES OF CARRYING ON THE GAS-FITTING BUSINESS.

In introducing the question showing the advantages to gas companies of carrying on the gas-fitting business, I feel considerable delicacy; in the first place, because, to an intelligent company like the present, I am afraid I shall not be able to say anything new upon the subject, and secondly, because the subject may have been fully discussed by most of you elsewhere. But, as the same remarks will apply to almost every question connected with the manufacture and use of gas, I will proceed with the question, and if—copying a modest friend of mine—any of you should find that my opinions are identical with your own, you may take it for granted that you are right.

To me, the subject is a very important one, and as interesting as it is important. It is true it is neither profound nor metaphysical, but it is a question with many sides, and necessitates a certain amount of technical and scientific knowledge.

If we compare the advantages to a gas company of carrying on the gas-fitting business with the disadvantages, we shall find that the former are decidedly in the ascendant. Let us see—gas-fitting gives a better standing to a gas company, and enables a manager to make himself more known, and his company more popular. Many gas companies suffer from the fact that their managers have so seldom any occasion to call upon their customers, whereas with gas-fitting, a manager is not only called upon at his office, and in his show-room where he keeps his chandeliers and better class of gas-fittings, but on many occasions he has an opportunity of calling upon his customers to advise upon matters connected with lighting, cooking, and heating, &c., and in all these interviews he has special opportunities of correcting faults and prejudices, and of giving information in the proper use of gas, that is beneficial both to the consumer and the company. I am of opinion that an intelligent gas manager is always listened to upon gas matters, and consumers will always take his advice more readily than the advice of an ordinary plumber or gas-fitter.

Bearing upon this view of the case, I will just mention a little incident which occurred with myself about two years ago, and which fully illustrates what I mean. A certain alderman, with a five-light chandelier in his dining-room, complained to my Chairman that the gas consumed in the room always created an offensive smell, that he had had a gas-fitter to inspect the matter, and that the gas-fitter had blamed the gas. I called upon the alderman, saw his wife, and found that the prejudice against the gas—for there was absolutely no fault—had originated with her, and that it had spread amongst all their friends. I at once put on a very scientific air, and carefully examined the burners and globes, which had been put on by their gas-fitter, and, of course, I condemned them all—the burners for not securing a complete combustion of the gas, and the globes for being too small for such sized flames. The next day I sent a fitter to change burners and globes, and a week after I called again, found the lady of the house had completely changed her opinion, and everybody else had, of course, followed suit. She asked me to step into the room, said they had some friends to supper, and she would be delighted if I would stop and join them. I did so, and had a very pleasant evening. And all this, Mr. President, came of my curing a fancy which was mischievous to the gas company, but for which there was no foundation whatever, for the change I made in the size and shape of the globes and burners, and my talk about products of combustion, and luminosity, &c., were purely nominal. Of course, cases like this, *minus*, perhaps, the supper and the pleasant evening I spent, could be quoted by the score.

The absence of the gas manager's influence is also prejudicial in many other ways, and gas is made the scapegoat for covering the incapacity and ignorance of men who call themselves gas-fitters, and who, in cases where the gas manager has nothing to do with fitting, are the only authorities for the consumers to appeal to. Bad burners, short supply of gas, flickering lights, &c.—which may be cured by an intelligent gas-fitter—are often charged pell-mell upon the nature and quality of the gas. I have frequently met with so-called gas-fitters, who practically knew nothing about calculating the sizes of pipes necessary for a given number of lights. The consequence is that they often start from the meter with a pipe not half large enough. In fact, in many cases, it is not entirely the result of ignorance. Take the case of plumbers and gas-fitters, who contract to do the plumbing and gas-fitting in new buildings. It not unfrequently happens that the only instructions given to them are to fix a given number of lights in certain defined places. If there is competition, they will be prompted to supply small pipes, and, if there is no competition, they will, for the sake of profit, be prompted to do the same thing. Nay, I have known of little immoralities even at York—and York is a Cathedral city—where ¾-in. pipe has been charged as ⅝-in., and ⅝-in. as ½-in., &c.; and, in one case, where I was consulted about the settlement of a disputed account, the fitter justified himself upon the ground that he measured the outside diameter of the pipe, and not the inside, and of course he charged the outside prices.

In these cases, however, it would scarcely be just to the gas-fitter that he should carry all the blame. He is often hard pressed by his customers to provide cheap gas-fittings, and, like most men who have any human nature in them, he will oblige his customers rather than miss the job; for he knows, if there is any fault in the lights, that he can easily transfer the cause to the shoulders of the gas company, and consumers, as a rule, will always back him up. We had a complaint of this kind a short time ago, and the only attempt at reasoning I could get out of the person making the complaint was that his pendant was quite new—that he had given 35s. for it, and that, therefore, he ought to have a good light.

But, in the case of gas companies, they not only keep men who can intelligently calculate the sizes of pipes and fittings, but it is their interest to fix pipes large enough. For, on the one hand, the consumer will use more gas, and, on the other, there is less chance of complaints during the consumption.

Again, where ordinary plumbers and gas-fitters have an opportunity to charge high prices for fittings, they do, and so check the use of gas, for it is a fact, amongst needy people especially, that the first cost of fitting up a house has everything to do with deciding a person whether he will have gas or not. Hence, whether the door is open for a gas-fitter to charge high, or whether he is compelled to charge low, his interest is always in the fittings, and not in the gas, which, I submit, is another reason why gas-fittings and gas-making should go hand in hand.

Apart from these reasons, there are others of greater importance. As "good wine needs no bush," so gas lighting now in large towns practically needs no recommendation. Indeed, not only is the heat and sweat of the introduction of gas lighting over, but, according to some, "its summer is ended," and it is on the point of being snuffed out. But the important reasons I allude to have reference to the use of gas for cooking and warming purposes. And here we have a field that is in its infancy, and a field that is capable of vast expansion; for, however the electric light may compete with gas for lighting purposes, it is not likely ever to be used for cooking mutton chops. Precisely the same prejudices which stood in the way of gas for lighting stand more or less now in the way of gas for cooking and warming; and who are so suitable in motive power for overcoming these prejudices, and enlightening the public upon the efficiency and economy of gas for these purposes, as gas managers? An ironmonger or gas-fitter can sell ovens and stoves, but, as a rule, he cannot intelligently explain their working, nor their working cost in gas. If he pushes the trade, he aims at getting profit out of the article sold, whereas the gas manager's aim is to get profit out of the gas. His motive power, therefore, induces him to sell his stoves cheap, and so make them the medium for pushing the sale of gas. Two or three gas companies, who have appreciated the advantages of carrying on gas-fitting, have even gone so far as to let out cooking-stoves on hire. Whether this is the better plan or not is perhaps a debateable point, and one which I shall leave for this meeting to discuss. For some years past I have endeavoured to popularize the use of gas for these purposes, and I attribute the success we have attained in York to the fact that we carried on the business of gas-fitting, and personally advised our gas consumers upon all matters connected with its use. I cannot give you the number of cooking-ovens, portable boilers, and warming-stoves now in use in York, but I can safely say that they may be counted by hundreds. Perhaps if I give you the effect upon our day consumption in midsummer, of using gas for these purposes, that will answer my purpose. Now, our day consumption, from six a.m. to six p.m., is 23 per cent. of the 24 hours total; whereas in 1868, ten years ago, when but little gas was used for cooking, the day consumption was only 6 per cent.

There is just one feature bearing upon the use of many heating-stoves to which I would ask special attention, and which is, in my judgment, a strong argument in favour of gas companies carrying on gas-fitting. I have known several instances where gas-stoves have been used, and afterwards abandoned on account of faulty fixing, or a faulty supply of gas. In some cases, the products of combustion are allowed to pass off in the room, and in others where they ought to pass away through a flue, they are blown back, and so the air of the room is vitiated and the occupier disgusted. The back draught will sometimes also blow the light out; and where this happens there is not only vitiated air, but actual danger of explosion on account of the gas escaping into the room. To expect an ordinary gas-fitter, or plumber, or tinner to understand the mechanism and technicalities connected with these matters is, perhaps, expecting too much, but it ought not to be too much to expect this knowledge from a gas manager. I would even go further, and say that a gas manager ought not only to be able to deal practically with every form of gas-fitting, but he ought to know something of the principles of chemistry and pneumatics, so far as they have to do with the healthiness and ventilation of a room. It is true a gas manager may know all this theoretically; but, in point of fact, if he has had no experience, he does not know. And if it is a deplorable thing to find a gas-fitter ignorant of the science of lighting, and cooking, and heating by gas, and not, in fact, posted up in every new invention bearing upon these matters, from a burner to a service-pipe, what must it be to find such ignorance, or any part of it, in a gas manager? Of course, I know that no such manager can be found in the North of England, and that, if we want to find a specimen, we shall have to look elsewhere.

Another argument which I would submit in favour of gas companies being gas-fitters is the command it gives to gas managers over the kind of meters which consumers may wish to use. In our experience—which, I believe, will be the experience of most gentlemen present—we find that the wet meter is decidedly preferable to the dry. Our rule is to let the wet meter out on hire; but, if a consumer wishes to have a dry meter, we require him to buy it, and be responsible for keeping it in order. In all such cases a gas company who carry on gas-fitting have a far better chance, through their staff of fitters, to checkmate the use of dry meters than a company who have no such staff. Many gas-fitters, plumbers, and ironmongers keep a stock of dry meters for sale, and they invariably recommend them to their customers; partly, because they do not understand meters, but, mainly, because dry meters yield the more profit. And perhaps another reason may be cited; dry meters do not generate water in the fittings, and therefore often hide a multitude of sins where pipes are improperly laid.

Lastly, gas companies can afford to keep a better and more varied stock of gas-fittings, and gas cooking and warming apparatus than ordinary fitters, and they have a greater interest in introducing the newest inventions. Hence, I believe that it is a fact that where a company do the gas-fitting there are fewer complaints against the gas, and the fittings in the town are usually of a better and more modern description.

And now, having submitted a few reasons in favour of the position I have taken, I will submit another, and then leave the decision to you. Independently of all other considerations, gas-fitting answers to that great test of all tests—it pays.

Mr. T. Trewhitt (West Hartlepool) said he thought they were all much obliged to Mr. Sellers for having introduced this subject. His Company had done a considerable trade in gas-fittings for the last 30 years, not only with advantage to themselves, but also to their customers. The great difficulty with plumbers was that they so often fixed pipes which were too small. Under the eyes of the gas manager, this difficulty would be removed.

Mr. J. Pattinson (Newcastle-on-Tyne) said that he could confirm what Mr. Sellers had said. As Gas Analyst for the Corporation of Newcastle, he had invariably found, where parties complained of bad gas, that, on sending to the Company, the complaints were instantly cured—the cause not being in the gas itself, but in the fittings. He thought if the public had their fittings done by the company or the corporation, as the case might be, they would have a thorough guarantee that the work would be well done.

Mr. S. Rutter (Brampton) said he agreed with Mr. Sellers that it was the proper thing for gas companies to do the fittings; but there were difficulties, particularly in small towns, where plumbers thought they were being robbed if their work was done. He had cured several cases of defective lighting himself by changing the burners, but had not been so fortunate as Mr. Sellers in being invited to supper for doing so; in fact, he had given away a couple of gross of burners lately, for which he had not received sixpence.

Mr. Warner said this question had not been a difficult one for small companies only, but he believed also for large companies. The Liverpool Gas Company had done a very extensive business in gas-fittings for many years, but he believed they lost in public opinion more than they gained in profits. With regard to what had been said about gas managers putting themselves in a good position with the townspeople, he thought, while it was right to show tact and courtesy in their dealings with every one, gas managers had higher and better work to do than running after every consumer. Still he agreed that gas companies should have something to say in the matter of gas-fittings. One of the chief causes of complaint had been already alluded to—that of small pipes. The Corporation of Leeds about two years ago tried to get clauses inserted in their Act of Parliament giving them power to supply pipes in houses, but they were refused. The subject was a fair one for discussion. In these days, when they were

threatened with the competition of other modes of lighting, they must do all they could to economize gas. The question of meters had been alluded to by Mr. Sellers, and he thanked him for it. Many complaints arose from meters registering incorrectly. Gas should be supplied through meters that were unvarying in their measurement.

Mr. A. Stewart (Glasgow) said there was no doubt the gas manager was the best judge of the proper sizes of pipes to be used in conveying gas through a house, but there might be a difficulty in allowing a gas company to do a business which some people considered would give them a monopoly, and so cause trouble to arise in the town. Could this difficulty not be got over by the company keeping gas-fittings, and gas-fitters having to purchase from them?

Mr. J. Booth (Middlesbrough) said that before he went to that town the Corporation had given up the business of gas-fitters, but he confessed that his experience since then had brought him to the opinion that it would be wise to take it up again. As a general rule, however, he had to say that whenever he had advised plumbers on the size of pipes to be used, his advice had been acted on.

Mr. W. Smith (Darlington) said that he believed if Gas Companies or Corporations would supply gas-burners, it would have a material effect on the illuminating power; further, if they would take the trouble to issue printed slips, with the sizes of pipes required for a certain number of burners, it would obviate the other difficulty mentioned—of small pipes.

Mr. S. Studholme (Whitehaven) said he thought it was their duty to give all the information possible to gas consumers, and to cultivate good feelings with them, and he adopted the suggestion of Mr. Smith as to the issue of slips as a very good one.

Mr. Whyte said there was another reason, besides that of small pipes, why gas-fitting should be in the hands of companies, and that was the unworkmanlike manner in which the gas-fitting was so frequently done. Instead of giving away two gross of burners, as Mr. Rutter had done, he had given away at least ten gross, and it had paid him in the end.

Mr. D. M. Nelson (Glasgow) said that from a consumers point of view he would like to know what provision would have to be made, supposing gas should be reduced in illuminating power, as he had known it to be—say from 40 to 20 or 22 candles. The same area of pipes would not be required for the one quality as for the other.

Mr. Tobey said the great bar to the introduction of gas into houses was the cost of it. Profits on this business, he had been informed, had reached as far as 100 per cent. Some time ago he gave out gas-stoves, and the consumption of gas in the daytime rose to 40 per cent. of the consumption of a day in summer.

Mr. Ford said they formerly did gas-fitting business at Stockton, but the tradesmen waited upon him for the purpose of getting the Corporation to give up competing with them, and after hearing what they had to say, he considered it would be better for the Corporation to give the business up, and leave it in the hands of men who were ratepayers, and in some cases were paying rents. At the same time, he approved of Mr. Smith's suggestion for the regulation of the size of pipes.

The President said the gas-works at Carlisle belonged to the Corporation, as they also did in Stockton, and they carried on the business of gas-fitting, as they thought it right to consider not only the few ratepayers, but the many. At the same time, they did not prohibit others from joining in the business, and although a great deal of low-class property was fitted up by plumbers, who had more regard to profits than to the perfection of their work, still this did not apply to the plumbers of Carlisle generally, who did their work well. The suggestion of issuing slips of sizes of pipes he thought was a good one, and plumbers would be very glad to have the information.

Mr. Sellers, in reply, thanked the members for their reception and friendly criticisms of his paper. He said it seemed to be admitted by all that bad fittings were invariably the cause of bad lights, and, therefore, of bringing disgrace upon gas managers; and gas companies, he thought, in self-defence, were justified in protecting themselves by connecting the gas-fitting business with the manufacture of gas itself. Further, as the public suffered by being compelled to rely on incompetent workmen to do their gas-fitting, it was, even upon public grounds, the duty of companies to protect them, and especially was this the case with corporations. Unfortunately, some members of corporations thought more of protecting their own individual interests, and the interest of their friends, than the broad interests of the community at large. The word monopoly had been used in the course of the discussion, but it could be no monopoly for a gas company to take the position of gas-fitters, as no consumer was compelled to deal with them. On the other hand, if a gas company or corporation declined to carry on gas-fitting, because they did not like to come into competition with plumbers, it was virtually handing over the public to a monopoly of plumbers, and in all such cases the public had a right to complain.

Mr. J. Pattinson, F.I.C. (Gas Examiner to the Newcastle-on-Tyne Town Council), read the following paper

ON THE RELATION BETWEEN THE SULPHUR TESTS OF WRIGHT, LETHEBY, AND THE LONDON GAS REFEREES.

The Newcastle and Gateshead Gas Company undertake, in accordance with their Act of Parliament, to supply Newcastle-on-Tyne with gas which shall not contain more than 17 grains of sulphur per 100 cubic feet of gas; and it is one of my duties, as Gas Examiner to the Town Council, to ascertain how far this requirement is complied with. No particular apparatus for determining the sulphur is prescribed by the Act, and knowing that Wright's sulphur-testing apparatus was used at Newcastle at the time of the passing of the Act, both by the advisers of the Town Council and the Gas Company themselves, I have thought it but fair to continue to use this form of apparatus in testing the gas on behalf of the Town Council, even although I was aware that it had been condemned as giving untrustworthy results, and indicating much less sulphur than the Letheby apparatus subsequently more generally used. But the condemnation of Wright's apparatus is very vague and indefinite, and I have been unable to find any published statement showing the relationship between the results obtained by it and by other methods of testing for sulphur. According to Wright's test, Newcastle gas usually contains a very small amount of sulphur, as compared with London gas tested by the Gas Referees sulphur apparatus. Newcastle gas, by Wright's test, is shown to contain, very frequently for months together, not more than from 5 to 8 grains per 100 cubic feet, whilst some of the London Gas Companies have great difficulty in keeping the amount of sulphur down to 15 grains when tested by the Gas Referees apparatus. It is, therefore, of some interest to ascertain how far this difference is due to the different forms of apparatus used, and it is the object of this paper to give the results of some comparative experiments I have made for this purpose with Wright's apparatus, the London Gas Referees apparatus, and the Letheby apparatus.

As many of the members are aware, Wright's apparatus consists of a glass tube about 34 inches long, and about ⅜ inch diameter, bent, at about 9 inches from one end, to an angle of about 80°, and passing, for nearly the remainder of its length, through another tube filled with cold water, thus forming what is known as a Liebig's condenser. The products of combustion, together with a little ammoniacal vapour, are passed through this tube, and the condensed water from the products of combustion is collected at the end of the tube for examination for sulphur. In using this apparatus I burn the gas at the rate of about ¼ foot per hour, and the tube is kept cool by allowing a rapid drop of water to pass constantly from the cooling-tube. The burning jet of gas is placed over a vessel containing about 2 oz. of strong liquid ammonia diluted with about 3 oz. of water.

The Gas Referees apparatus used was one supplied for the use of the Gas Testers in London. It was used exactly in the manner described in the Gas Referees Instructions 2 oz. of carbonate of ammonia being taken for each test.

The Letheby apparatus used was one of the older and larger form, being about 7 inches in diameter. A single jet of gas was used, and not a Leslie burner.

In the first series of experiments, the different kinds of apparatus were all used together at the same time, in the same room, and all burning gas from the same supply-pipe. There can, therefore, be no doubt that the same quality of gas was burnt in each apparatus.

The following table shows the rate per hour at which the gas was burnt, and the amount of sulphur indicated, per 100 cubic feet of gas, by each apparatus:—

No.	Wright's.		Gas Referees.		Letheby's.	
	Cubic Feet Gas burned per Hour.	Grains of Sulphur.	Cubic Feet Gas burned per Hour.	Grains of Sulphur.	Cubic Feet Gas burned per Hour.	Grains of Sulphur.
1	0·257	18·64	0·505	19·77	Not	used.
2	0·260	13·69	0·521	15·13	0·241	10·66
3	0·237	11·42	0·511	12·77	0·266	8·68
4	0·260	8·77	0·492	9·81	0·344	7·16

From some unexplained cause the amount of sulphur had risen to much higher than the normal amount in Newcastle gas at the time the experiments were tried. This circumstance, however, does not lessen the value of the tests as comparative tests. Taking the results of the Gas Referees apparatus as the standard, the other tests show the following deficiencies:—

No.	Grains of Sulphur less by Wright's Test.	Grains of Sulphur less by Letheby's Test.
1	1·13	Not used.
2	1·44	4·47
3	1·35	4·09
4	1·04	2·65

It will be seen that Wright's tests approach the results of the Gas Referees tests much nearer than the Letheby tests do. The latter are about 36 per cent. below the Gas Referees tests—that is, by adding 36 per cent. to the Letheby results, you approach very nearly to the Gas Referees results. It is worthy of remark that this is almost exactly the proportion of difference between the Gas Referees test and the Letheby test found by the Gas Referees themselves, as described in their report upon the "Sulphur Qestion, 1870," pp. 10 and 11.

In Wright's apparatus, as shown by the above experiments, the sulphur tests are about 10 per cent. below the Gas Referees tests—that is, the Gas Referees tests are very nearly approached by adding 10 per cent. to the Wright's tests.

It appeared to me desirable that further experiments should be made, comparing the Wright's apparatus with the Gas Referees apparatus when burning gas containing the usual quantity of sulphur—viz., from 5 to 8 grains. I have, therefore, made a further and longer series of tests with gas of this quality. In this case the two kinds of apparatus, although in use at the same time, were not in the same room, but were about 200 yards apart. During the time the experiments were in progress, however, the quality of the gas as regards sulphur was very uniform, so that I have no doubt that practically the same quality of gas was burnt in both forms of apparatus.

The following table shows the rate per hour at which the gas was burnt, and the grains of sulphur found per 100 cubic feet of gas:—

No.	Gas Referees.		Wright's	
	Cubic Feet of Gas burned per Hour.	Grains of Sulphur.	Cubic Feet of Gas burned per Hour.	Grains of Sulphur.
1	0·552	6·24	0·180	5·82
2	0·876	7·37	0·258	6·05
3	0·570	6·72	0·259	6·11
4	0·627	6·20	0·229	6·02
5	0·378	6·64	0·217	5·21
6	0·542	6·56	0·286	5·65
7	0·509	6·07	0·198	5·62
8	0·448	7·02	0·203	7·23
9	0·510	6·31	0·132	6·32
10	0·494	6·69	0·293	5·71
11	0·498	6·03	0·212	5·82
12	0·403	6·49	0·209	5·72

The average of the above twelve tests in the Gas Referees apparatus is 6·53 grains per 100 cubic feet of gas. The average of the tests in the Wright's apparatus is 5·94 grains, or 0·59 grain less than the average of the Gas Referees tests. This is again, as in the first series of experiments, a deficiency of 10 per cent. It would appear, therefore, from all these experiments, that Wright's sulphur apparatus arrests more of the sulphur compounds in the products of combustion than Letheby's apparatus; and that by adding 10 per cent. to the amount of sulphur found by Wright's apparatus, the amount of sulphur which the Gas Referees apparatus would indicate when testing the same gas will be closely approached.

The fact that Newcastle gas contains so little sulphur as compared with London gas being thus, as I think, clearly established, there remains the interesting question, what is the cause of this difference? If time will permit, I purpose making some experiments bearing on this point shortly, the results of which I shall probably bring before the Association on some future occasion.

Mr. Ford asked how it was, seeing that the Constructing Engineer for the Newcastle Gas-Works acted in the same capacity for Beckton, Mr. Pattinson could account for the great difference in the purification at the two places.

Mr. Pattinson said that his experiments were made with gas manufactured at the old works in Newcastle, which were not engineered by the gentleman in question. He believed he would be able to throw some

light on the question raised by Mr. Ford by some experiments which he was now making, and which he would report at a future day.

On the motion of the PRESIDENT, a hearty vote of thanks was accorded to the several gentlemen who had favoured the meeting with papers.

Mr. SMITH then introduced a motion, of which he had given notice, viz.—"That two prizes of books be given, one of £3 3s. and the other of £2 2s., for the two best papers produced during the year."

Mr. NELSON seconded the motion.

Considerable discussion followed; the opinion being somewhat divided as to whether the prizes should be given for a specified subject to be named by the Committee, or for general subjects, to be chosen by the competitors themselves. Ultimately it was agreed that the choice of subjects be left to the writers, and that the prizes be given for the best papers produced at the next meeting.

Mr. FORD moved—"That, in view of the projected meeting of the British Association of Gas Managers at Newcastle-on-Tyne, in June next, the President, Vice-President, and Committee of this Association be a committee to make arrangements for their reception, and that they have power to add to their number."

Mr. SMITH seconded the motion, which was carried unanimously.

Mr. PATTINSON moved a vote of thanks to the Mayor of Carlisle for his courtesy in granting the Association the use of the Town Hall.

The motion was seconded by Mr. WARNER, and carried by acclamation.

The MAYOR replied, expressing the pleasure it gave him to see them assembled there, and invited the whole company to dine with him at the Bush Inn.

The dinner took place at 4 p.m., and was served up in a most sumptuous and elegant manner. The Mayor himself presided, being supported on the right by Colonel Cowen, of Blaydon-on-Tyne, and on the left by Mr. D. Laidlaw, of Glasgow. Mr. Hepworth occupied the vice-chair. After the usual loyal toasts had been given, the Mayor proposed "Success to the North of England Gas Managers Association," and said that the Members, in promoting their own profession, were conferring a great blessing on the people. Mr. Hepworth acknowledged the compliment, and said that sometimes it had been a matter of controversy whether gas-works should be transferred to corporations, but after what they had seen to-day, and their very hearty reception by all connected with the Corporation of Carlisle, they would go home and wish themselves all transformed into corporation gas-works managers. The health of the Mayor was proposed in the most complimentary terms by Colonel Cowen, an old personal friend, and, in returning thanks, his Worship expressed a hope that before many years were over the Association would again visit Carlisle. The other toasts honoured were "The Gas Committee of Carlisle," proposed by Mr. Cox, of Sunderland, and responded to by the Vice-Chairman of the Committee; "Success to the British Association of Gas Managers and other kindred Associations," proposed by the Mayor, and responded to by this year's President, Mr. Warner; "The Committee of the North of England Gas Managers Association," proposed by Mr. Pattinson, F.C.S., and responded to by Mr. Hardie, the Hon. Secretary; and "The Press," proposed by Mr. Sellers. The party then broke up, after having passed a most enjoyable evening.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

But that the coal trade is helped up by the extra demand for house-fire classes of fuel, brought forward by the colder weather, business, all through, would be in an extremely depressed condition, as there is still no improvement whatever in the demand for any description of fuel for general manufacturing purposes, and with the exception that best coals are steady at late rates, there is a general want of firmness in prices, colliery proprietors who push for orders in the open market having to take very low figures. In gas coal there is little or no new business doing, the bulk of this description of fuel which is now being sent away from the collieries being on account of contracts entered into during the season, and prices are nominally without change, ranging from 6s. 6d. to 7s. 6d. per ton at the pit, according to quality. The unreasonable panic which during the past week has taken place in gas shares, consequent upon the reported new development of the electric light, does not seem to have had much effect upon the raisers of gas coal, who evidently do not think their interests are, for the present at least, threatened to any very material extent. Common coal for steam and iron-making purposes continues very bad to sell and low in price, ranging from 5s. to 6s. per ton at the pit mouth. Engine classes of fuel are now plentiful in the market, and prices are easier; the average selling price for burgy at the pit ranging from 4s. to 4s. 6d. per ton, and for good slack 3s. to 3s. 6d. per ton.

The shipping trade continues very dull for the season of the year, and it is only in exceptional cases where any extra inquiry, which ought now to be experienced, is coming to hand, and prices remain very low.

There has been very little doing in the iron trade during the past week, buyers having been holding back for lower prices, to which they seem to expect makers will have to give way. Lancashire producers of pig iron, however, do not as yet show much sign of reducing their quotations beyond a very slight concession upon the list rates; and it is chiefly in outside brands that any downward tendency is really noticeable. Manufactured iron is very dull, with prices for delivery into the Manchester district remaining at about £6 per ton; but there is little doubt that good specifications would be taken for less money

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The gas coal trade is active. Collieries working best and medium qualities are fully employed. The price is 7s. per ton net, best, and 6s. per ton net, medium. There was a good supply of steam tonnage for the coasting trade last week, and the shipments of gas coals were more active. A fleet of coal-laden sailing vessels detained in the northern ports and in the bays on the Yorkshire coast, through stormy weather, were able to proceed upon their voyages south on Friday, there being a favourable change in the wind on that day. Some few of the gas collieries in Durham lost a day or two last week for want of sailing tonnage, but ships began to drop in, and the work of the collieries in the latter part of the week was pretty uniformly good. The best household collieries in Durham, especially those upon the coast, are doing pretty well. Some others are less fortunate. In the steam coal trade of Northumberland most of the leading pits have done very well. Dinnington Colliery, however, has been laid in, and Killingworth Pit, where George Stephenson, the famous railway engineer, was brakesman in his early life, is likely to follow, as the men are under notice. The price of Northumberland steam coals is low.

In the shipping trade, coasting freights were pretty firm in the early part of last week, but towards the latter end of it tonnage was more abundant, and on Saturday the market was a little depressed. Pretty good rates have had to be paid small ships to load gas coals for the British Channel. The steamers which were specially built in the early part of the year to go above London Bridge with gas coals from the Tyne ply very rapidly, and attain a high rate of speed. They seem to be a great success.

The general manufacturing trade of the Tyne was certainly not worse last week than the week before. Indeed, the shipments of chemicals and other goods to the Continent were rather better. The price of chemicals, fire-clay goods, and all material of that sort is low. The business in the North, though extremely dull, has not suffered so much from the effects of the derangement of credit in Glasgow as was anticipated.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

On Saturday an inspection of the Johnstone Gas-Works was made by the arbiters appointed with a view to having the works transferred to the Police Commissioners of the town. Mr. Henry Green, Preston, represented the Gas Company, and Mr. William Brodie, Paisley, was the representative of the Burgh Commissioners. Dr. Anderson Kirkwood, Glasgow, attended as the oversman, and Mr. James Reid, Town Clerk, was also present. It is expected that the negotiations, which have long been in progress, will now be very soon completed.

The Paisley Corporation Gas Commissioners are about to petition the Home Secretary for a Provisional Order giving them power to borrow an additional sum of money, not exceeding £30,000, under the Paisley Gas Act, 1870, for the purpose of defraying the expenses of extending their works, which has been rendered necessary in consequence of the increased demand for gas in the town. Sheriff-Substitute Cowan is to hold an inquiry on Monday, the 28th inst., in reference to the matter.

On Saturday, the 5th inst., the Newport Gas Company held their annual meeting, when a dividend of 7½ per cent. on the called-up capital of £6300 was agreed upon. Mr. Leng, of the *Dundee Advertiser*, expressed a little disappointment that a reduction in the price of gas supplied in Newport was not recommended, and mentioned that a suggestion had been made to bring not only water, but gas, from Dundee over the Tay Bridge. He thought that the difference between the price in Dundee and Newport was too great. The Chairman doubted if the gas could be brought over the bridge at a less rate than it was supplied by the Company; and he thought that now the capital outlay was completed, the price would steadily diminish as the supply extended.

In addressing his constituents, the Nine Incorporated Trades of Dundee, last Monday night, Mr. Mitchell referred to his connection with the Gas Commission, in which he held the office of Convener of the Finance Committee. He remarked that the officials of that Board were men of ability, who put their whole heart and soul in the work, and he believed that the people of Dundee had gas supplied to them at a lower figure than those of any other town in Scotland. [Why is the 3s. 9d. rate in Galashiels so persistently ignored?] That, he said, was mainly owing to the indefatigable energy of their Manager, Mr. M'Crae, and to the good bargains which they had been able to make for the supply of coal. At the present time they were contemplating the erection of a large gasholder, so as to take advantage of the cheap price of iron and labour. As they were aware, the electric light had been taking some little precedence in the eyes of Gas Engineers; but from a report by Mr. M'Crae, he did not think they need be afraid of the new light, as it could not be made generally available for illuminating rooms, though it might answer very well for streets.

The Town Councillors of Glasgow have again commenced to meet their constituents in the various wards of the city, and to give an account of their stewardship for the past year. Gas affairs have cropped up at two or three of the meetings. One of the Councillors—Mr. James Reid—an eminent locomotive engineer, in addressing the electors in the Third Ward, spoke in rather strong terms, and certainly with some degree of authority, as a Member of the Gas Committee. In that capacity he had visited and carefully inspected the gas-works, and in the course of his inspection he had found "a good many leaks." He was sorry to say that one of the "leaks" was that all the Managers were absent with the exception of one. Another and a serious "leak" was that the Corporation were losing large sums of money annually by the use of horses in place of mechanical power in carting coals. Then, again, very great loss was occasioned through the upkeep of so many gas-works and managers. If the works were concentrated into, perhaps, two, a great saving would thereby be effected. He had no doubt that the reforms would be brought about in time, but when he had moved on the subject in Committee many of the members thought he was rather fast. I understand that in consequence of Mr. Reid's action in the Committee three of his recommendations are to be carried out, one of which is the closing of the works in Partick. Mr. Finlay, one of the Councillors for the Fourth Ward, also spoke on Corporation gas affairs. He said that when he entered the Gas Trust it was £17,000 behind, whereas now it had £40,000 to the good; and, by way of showing how prosperous it had become, he mentioned that it was probable that at May next year the price would be reduced to 3s. 9d. per 1000 feet. At the meeting of the First Ward, held last Monday, Mr. Stevenson, a ratepayer, took the retiring representative—Mr. William Brown—to task upon the question of gas profits. He wished to know if Mr. Brown would give the surplus accruing from the manufacture and sale of gas, to make up the deficiency of Corporation funds, or apply it in the reduction of the price of gas as at present. In reply, Mr. Brown said it was a misunderstanding to suppose that the surplus of the profits from the gas must go to the reduction of the price. The profits had always gone to the reduction of the price; but the Act of Parliament did not bind the Gas Commissioners so to do, and he thought it would be better that the money should go to the reduction of the debt than that the city should be behind. At a later stage of the proceedings, Mr. Stevenson submitted a motion to the effect that the meeting would deprecate any measure whereby the surplus derived from the gas should go for any other purpose than the reduction of the price. The motion was duly seconded, and adopted unanimously.

On Wednesday last, 137 original shares (formerly £3, now £5) of the Coatbridge Gas Company, dividends 10 per cent., were exposed for sale in Glasgow. The only purchase made was by Mr. James Wilson, Coatbridge—namely, 20 shares, at £10 10s. per share. The remainder were retained by the exposer, at the reserve price of £10 7s. 6d. On Friday, 85 shares of the Stirling Gas Company—£2 10s. each paid up—were sold by public auction, and realized from £4 11s. to £4 15s per share in lots of 20.

Last Monday, William Manclark, foreman of the Dunfermline Gas-Work, died from the effects of injuries received a fortnight ago by an accident which happened to a funeral party in the Public Park. He was severely cut and bruised about the head and face by the accident, and never regained consciousness; and from the first, little hopes were entertained of his recovery. The deceased, who had been in the employment of the Gas Company for the last 37 years, was, by his kind and obliging disposition, held in general esteem by his fellow-workers, and by all those with whom he was brought into contact. Much sympathy has been expressed for his widow and family. Mr. Manclark was 70 years of age.

On Saturday week, the new water-works for Catrine, an important manufacturing village in Ayrshire, were publicly inaugurated, amidst the greatest enthusiasm, by Mrs. Somervell, of Lorn Castle. Mr. M'Derwent, C.E., Ayr, was the Engineer for the works.

It is not long since the Irvine Water-Works were completed and handed over by the Engineers, Messrs. A. and J. Leslie, of Edinburgh, to the Irvine Water Commissioners, but already there are serious complaints of leakage at the filters—so serious, indeed, that one of the partners of that firm has been asked by the Commissioners to visit the works, along with the Committee, and to report.

One of the Town Councillors of Glasgow—Mr. Selkirk, the Treasurer to the Police Department—in speaking of municipal affairs, a few nights ago, gave prominence to the proceedings of the Water Committee, one of the most important and most successful trusts in the city. He said the daily average of water sent into the city for the year ending May last was 34 million gallons, being an increase of ½ million gallons daily as compared with the year preceding. But since May, when additional means were provided for supplying the wants of the city, the supply had mounted up to a daily average of 38 million gallons, and still remained at that. The population supplied was 750,000, of which 550,000 were included within the municipal boundaries. He explained the measures which were taken by the Water Committee to ascertain and check the waste which was believed to be going on; and said that in accordance with the requirements of the Water Act, it was the intention of the Commissioners to commence immediately to erect a number of drinking fountains in the various wards of the city.

The Glasgow pig iron warrant market was somewhat improved in the early part of the past week. A very large amount of business was done, and after some sharp fluctuations, the market closed on Friday with prices down at 44s. 2d. cash, and 44s. 4½d. one month, and the tone very dull, the decline over the week being 4d. per ton.

Dulness is still the rule in the Scotch coal market, which is doubtless, to some extent, due to the commercial disasters commencing with the collapse of the City of Glasgow Bank.

PURCHASE OF THE CARDIFF WATER-WORKS BY THE CORPORATION.—A special meeting of the Cardiff Town Council was held last Thursday, to consider the expediency of giving notice to the Cardiff Water-Works Company of the intention of the Corporation to purchase the works upon the terms agreed upon—£300,000. After considerable discussion, the scheme, which has already been fully stated in the JOURNAL, was agreed to by 24 votes to 1; and a Committee appointed to consider the details, and the best mode of raising the necessary money.

EXPLOSION OF GAS AT BLACKBURN.—Last Friday morning an explosion of gas, resulting in the injury of five persons, and considerable damage to property, occurred at a new mill at Blackburn, belonging to Messrs. Dugdale. It appears that an old meter, which had supplied the card-room, &c., with gas, had been taken out previously, and a new one placed in its stead, but it had only been coupled with the main temporarily, and on being tested on the previous night it appeared all right. It is supposed, however, that gas must have escaped throughout the night, for yesterday morning when one of the under-carders took a light into the shoddy-room, leading to the card-room, the gas exploded and carried off the roof, besides injuring the walls and smashing the windows of the engine-house close to, and the windows of other parts of, the mill. Five of the mill hands were somewhat severely injured. The damage to property is estimated at over £200.

APPLICATIONS FOR LETTERS PATENT.

3853.—WILKINSON, A., Marylebone, and WELLINGS, W., Harrow-on-the Hill, London, "Improved means of and material for lighting and heating (especially applicable to railway carriages and other portable conveyances), and burners for the same." Sept. 30, 1878.

3915.—CUTLER, S., Millwall, London, "Improvements in apparatus used in the manufacture of gas." Oct. 4, 1878.

3925.—CARSON, W., Egremont, Chester, "Improvements in and relating to the generation and application of illuminating hydrocarbon gases, and in apparatus connected therewith." Oct. 5, 1878.

3937.—LAKE, W. R., Southampton Buildings, London, "Improvements in gaslight extinguishers." A communication. Oct. 7, 1878.

3972.—WEATHERHOGG, G. W., Lambeth, London, "Improvements in gas motor engines." Oct. 9, 1878.

3985.—TYLER, H. W., Colchester, Essex, "Improvements in electric lighting." Oct. 9, 1878.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

1470.—BAILEY, W. H., Salford, Lancs, "Improvements in cocks and taps." April 12, 1878.

1509.—GEDGE, W. E., Strand, London, "An improved water-meter." A communication. April 16, 1878.

1582.—ROGERS, J. E., Smethwick, Stafford, "Improvements in adjustable spanners or screw-wrenches, and in pipe-tongs, and in combined pipe-tongs and pipe-cutters." April 18, 1878.

1589.—ALEXANDER, E. P., Southampton Buildings, London, "Improvements in valve-cocks or faucets." A communication. April 20, 1878.

1635.—WARNER, W. J., South Shields, Durham, "Improvements in machinery and apparatus for charging and drawing gas-retorts, and for doing the work immediately in connection with them." April 24, 1878.

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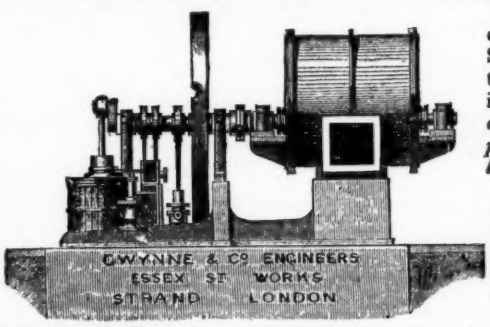

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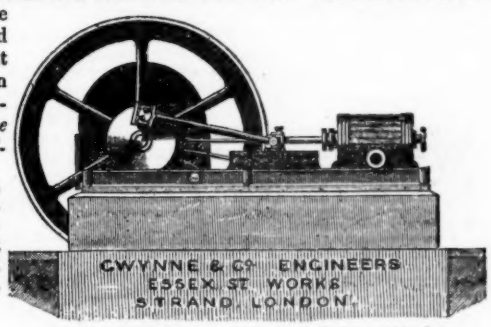

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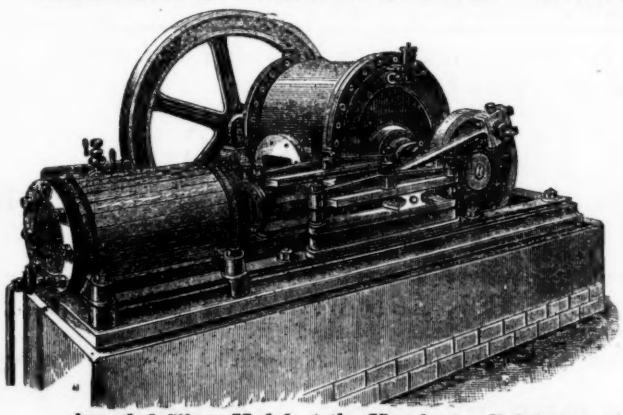

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Applications, enclosing testimonials, with references, and stating wages expected, to be addressed to the Secretary, Mr. J. HAMILTON.
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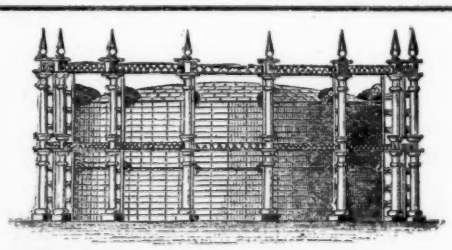

STOCKTON ON TEES.

ASHMORE & WHILE,

GAS ENGINEERS & CONTRACTORS,

MANUFACTURERS OF GASHOLDERS,

GAS APPARATUS OF EVERY DESCRIPTION,

Including Improved

Retort-Lids, Boilers, Cast and Wrought Iron Tanks, Iron Roofing, Bridges, Girders,

And GENERAL IRONWORK.

N.B.—Estimates for all Gas Plant and Remodelling supplied on application.

NOTICE TO MANAGERS OF GAS COMPANIES.

THE LAW UNION FIRE AND LIFE INSURANCE COMPANY, of No. 126, Chancery Lane, London, grants Policies of Insurance on Gas-Works, and Buildings connected therewith, which cover risk of explosion and spontaneous ignition of Coal, on very advantageous terms. Full particulars will be sent post free on application to FRANK M'GEDY, Secretary.

126, Chancery Lane, London.

MR. EDWARD SANDELL,

Associate of the Society of Accountants in England, Publisher of the "Gas Companies Expenditure Journal,"

Begs to announce his REMOVAL from Skinner's Place, Size Lane, to

No. 2, GT. GEORGE STREET, WESTMINSTER.

W. LIDDALL,

Public Accountant,

15, UNION COURT,

OLD BROAD STREET, E.C.

ALFRED LASS,

SPECIAL ACCOUNTANT FOR GAS COMPANIES,

30, GRACECHURCH STREET, LONDON.

Accounts analyzed and Statistics Prepared for Parliamentary Proceedings, Arbitrations, &c.

The Forms of Account, which have been specially designed to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, and have been universally approved.

The above forms are registered.

Water Companies Accounts also prepared and adjusted.

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BIRTLEY IRON WORKS,

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Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

Agent in London, Mr. J. MANWARING, 101 Cannon Street, E.C.

TO ENGINEERS & MANAGERS.—CLIFTON'S

PATENT COKE AND COAL BARROW

Is acknowledged to be the best Barrow in the Market.

For particulars, with Drawings and Prices, apply to the Sole Makers,

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BOUCK & CO., LIMITED,

TAR DISTILLERS & MANUFACTURING CHEMISTS,

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BUYERS OF COAL TAR,

And Crude Products therefrom,

AMMONIACAL LIQUOR, &c.

HEBBURN MAIN GAS COALS.

T. Stone, Esq., of Weymouth, writes on Nov. 17, 1876: "I have used about 12,000 tons of this Coal, with, I think, the best possible results, although not always under the most favourable circumstances. My Coal account made up to Midsummer last showed a makeage of 10,594 cubic feet per ton of 14½-candle gas, and not a hundredweight of Cannel used. This statement would, I know, be incredible to many men, and may provoke the remark, 'How much of it is paid for?' For the gratification of such, I have to say that, of the above quantity, 9866 cubic feet per ton of Coal carbonised were brought to charge and duly paid for, with the exception of about 6s. per cent. for bad debts. The coke is of excellent quality. The above facts I hold to be a greater recommendation to your Coal than any words of mine could be."

PRICES ON APPLICATION, EITHER F.O.B. OR BY RAIL IN TRUCK LOADS.

THE TYNE COAL COMPANY, LIMITED, OWNERS.

W. RICHARDSON, Fitter,

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PROPRIETORS OF THE CELEBRATED

ABRAM CANNEL,

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ARLEY MINE Four-feet, ORRELL,

And other Gas and House Coals.

ADDRESS:

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YEO'S PATENT ENGINE PACKING,

Price 1s. 8d. per lb., any size.
Tarred & White Spun Yarn for Pipe Joints, at various prices.
Samples and testimonials free per post.
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Also Makers of all kinds of Common Building Bricks, and of Pressed White and Red Bricks for Facing.

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effecting a great saving of time, labour, and expense.
For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

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J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.
Communications addressed to J. SUGG & Co., GHENT, will receive immediate attention.

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(Established 1820,)
FIRE-BRICK AND TILE MERCHANTS,
Wholesale and for Exportation,
FALCON DOCK, 78 AND 79, BANKSIDE,
SOUTHWARK, LONDON, S.E.,
DEPÔT for STOURBRIDGE AND NEWCASTLE
FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY,
and every Article suitable for
GAS AND WATER WORKS.

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WORKS:
DARTMOUTH & BRIXHAM (TORBAY) DEVON.
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SOLE PROPRIETORS AND MANUFACTURERS
OF
WOLSTON'S CELEBRATED
TORBAY IRON PAINTS.

TRADE MARK

These Paints have been for many years extensively used in Her Majesty's Royal Dockyards, Woolwich Arsenal, the Shorncliffe and Curragh Camps, War Departments, and Colonies, and are largely supplied to Railway, Harbour, and GAS COMPANIES, Shipowners, Engineering Establishments, Railway Carriage and Wagon Works, and the Paint Trade generally. They are the BEST PROTECTORS of WOOD, CEMENT, and IRONWORK, even arresting corrosion after it has set in; and their base being oxide of iron, they are free from those properties which make lead paints so destructive to iron. They do not scale or blister, are not affected by great heat, and are the only Paints which will resist the effects of sulphuretted hydrogen. Their DURABILITY and covering properties have borne the test of A QUARTER OF A CENTURY'S PRACTICAL TRIAL.

The undermentioned colours—ground in best linseed oil, and requiring only to be thinned down for use in the ordinary way—are kept in stock:—

Torbay Brown.	Torbay Red.
Dart Green.	Slate.
Dart Yellow.	Buff.
Brixham Black.	Torbay Chocolate.
Light Blue.	Cream Colour.
Dart Brown.	Dart Umber.
Imperial Stone.	Light Stone.
Bronze Green.	Salmon Colour.
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Carriage Red.	Dark Stone.
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All other Colours made to order.

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A great variety of Colours ready mixed for the brush are also always kept in Stock, in 3 lb., 7 lb., 14 lb., and 28 lb. cans.

Prices and Testimonials on application.

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MANUFACTURES AND SPECIALITIES,
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Screw Stocks, Taps and Dies, Tube Wrenches,
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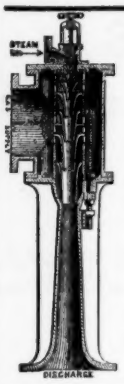
Staple and Parallel Vices, Vice-Benches, &c.
ESTABLISHED 1866.



KÖRTING'S STEAM-JET EXHAUSTER.

IMPROVED CLELAND'S PATENT.
UPWARDS OF 300 IN USE.
CLELAND'S SLOW-SPEED CONDENSER & STEAM SCRUBBER.

FOR PARTICULARS, APPLY TO

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OR TO
GERALD J. TUPP, 8, John Street, Adelphi, W.C.,
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SOLE AGENT FOR ENGLAND AND WALES.

J. BEALE'S NEW PATENT GAS EXHAUSTERS,

MANUFACTURED SOLELY BY
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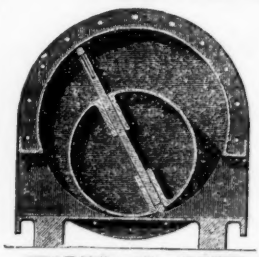

These Exhausters have but one solid slide, which ensures less wear and tear, and less friction, and thus fewer repairs are necessary. They are made with two outside bearings and all latest improvements.

MESSRS. B. D. & Co. ALSO MAKE
STEAM-ENGINES FOR DRIVING GAS EXHAUSTERS,
VALVES FOR GAS, WATER,
STEAM, HYDRAULIC MAIN, TAR, AMMONIACAL
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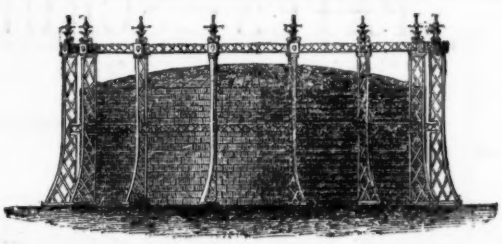

THE HORSELEY COMPANY,

LIMITED,

TIPTON, STAFFORDSHIRE.

LONDON OFFICE:

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AND ALL REQUISITES FOR EITHER

GAS OR WATER WORKS;

ALSO

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More than 10,000 in use,

ESPECIALLY ADAPTED FOR USE IN GAS AND CHEMICAL WORKS, FOR PUMPING TAR, WATER, AMMONIACAL LIQUOR, ACIDS, &c.

The following are some of the prominent advantages of the BLAKE PUMP:—

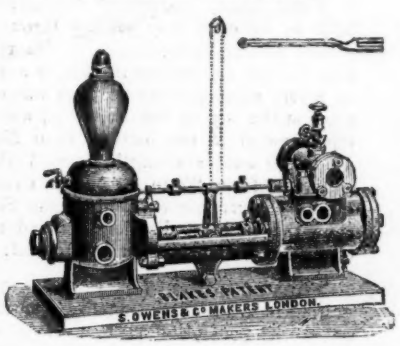
It will start at any point of stroke.

It has no dead point.

It works fast or slow, with the same certainty of action.

It is economical. Has a lead on the slide-valve.

It is compact and durable.



It is interchangeable in all its working parts.

It will deliver more water than any other pump.

It is made of best materials in the most workmanlike manner.

Can be worked at 20 strokes per hour, or 200 strokes per minute.

This Illustration represents Boiler-Feed Pumps, Sizes Nos. 1, 2, and 3, with Hand Lever for working Pump when Steam is not available.

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MANN & OWENS
IMPROVED PATENT GAS-VALVES.

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Keep in London and at their works large stocks of PIPES and CONNEXIONS (1½ to 36 inches in diameter); also make and supply Retorts, Tanks, Columns, Girders, Special Castings required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

CHARLES HORSLEY, Agent.

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SILICA FIRE-BRICK CO.,

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Near SHEFFIELD,

Manufacturers of THE ORIGINAL SILICA OR DINAS FIRE-BRICKS. Specially adapted for Gas-Retort Furnaces and for Siemens's Gas-Furnaces. Shipments promptly executed to London, Liverpool, Hull, Grimsby, &c.

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Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS, TILES, and every description of FIRE-BRICK.

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Successors to

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Of all Dimensions for Gas-Works,

GLASS-HOUSE POTS & CRUCIBLES

Of every kind.

The Highest Award was obtained by H. & M., at the Philadelphia Exhibition, 1876, for Superior Quality of Manufacture.

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WILLIAM MACLEOD & CO.,

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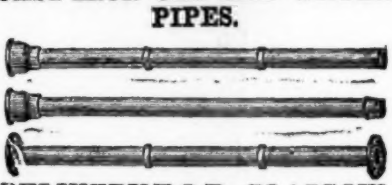
CAST-IRON GAS AND WATER PIPES.



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Prices on application.

SLUICE VALVES.

The STRONGEST, CHEAPEST, & BEST in the TRADE.

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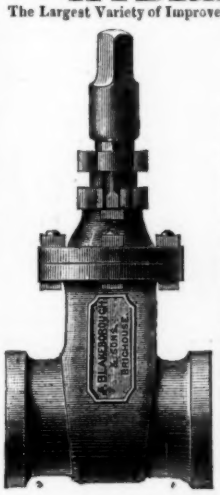
The Largest Variety of Improved Designs in the Market.



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SLUICE VALVES for Water.
DO. for Gas and Sewage, 1½ to 48 in.
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Ball Do.
Sluice-Valve Do.
STAND POSTS, various.
STREET WELLS.
STAND PIPES.
PATENT FIRE COCKS
STAND PIPES & JETS.
HOSE UNIONS and REELS.
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Tested with 600 to 1000 feet head of pressure.

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Contractors to the British and Indian Governments.

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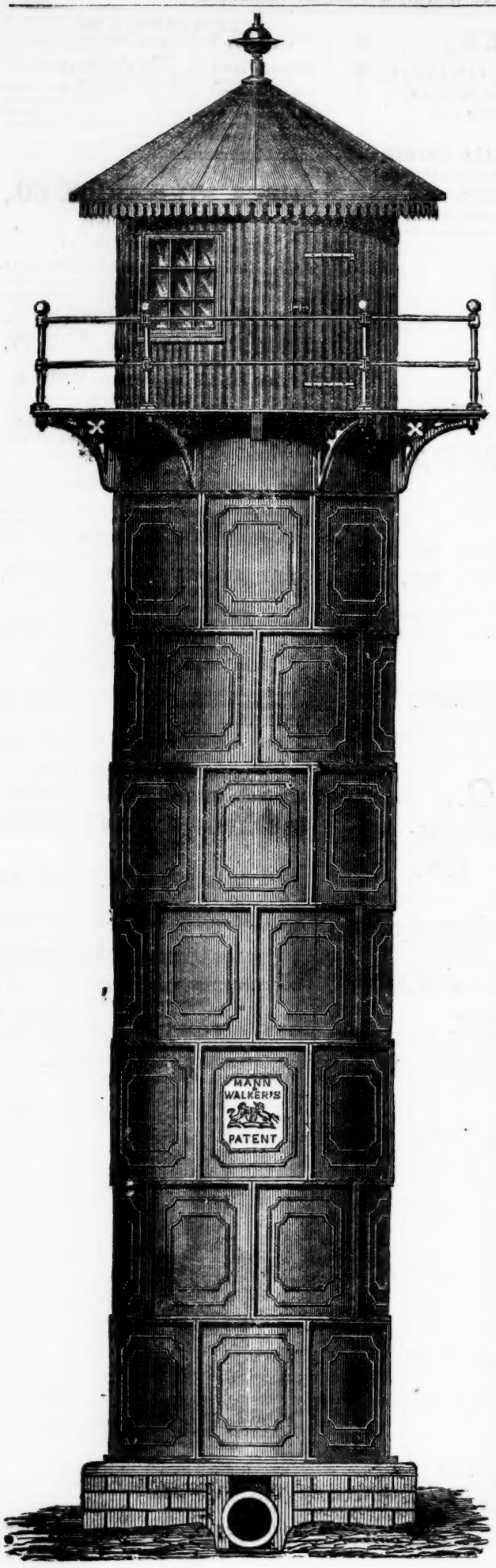

C. & W. WALKER,
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LONDON, E.C.

MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

By some important improvements recently patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

It is to be particularly noted that the im- portant results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

Fifty million cubic feet of gas per 24 hours are purified from ammonia by these Patent Scrubbers in a winter's day in the gas-works of London, where the purity of gas supply is the highest in the world, under the chemical restrictions of the Board of Trade.

Generally, wherever a high standard of purification is maintained in the chief cities and towns of the British Provinces and of Europe, these Scrubbers have become established.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals, generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

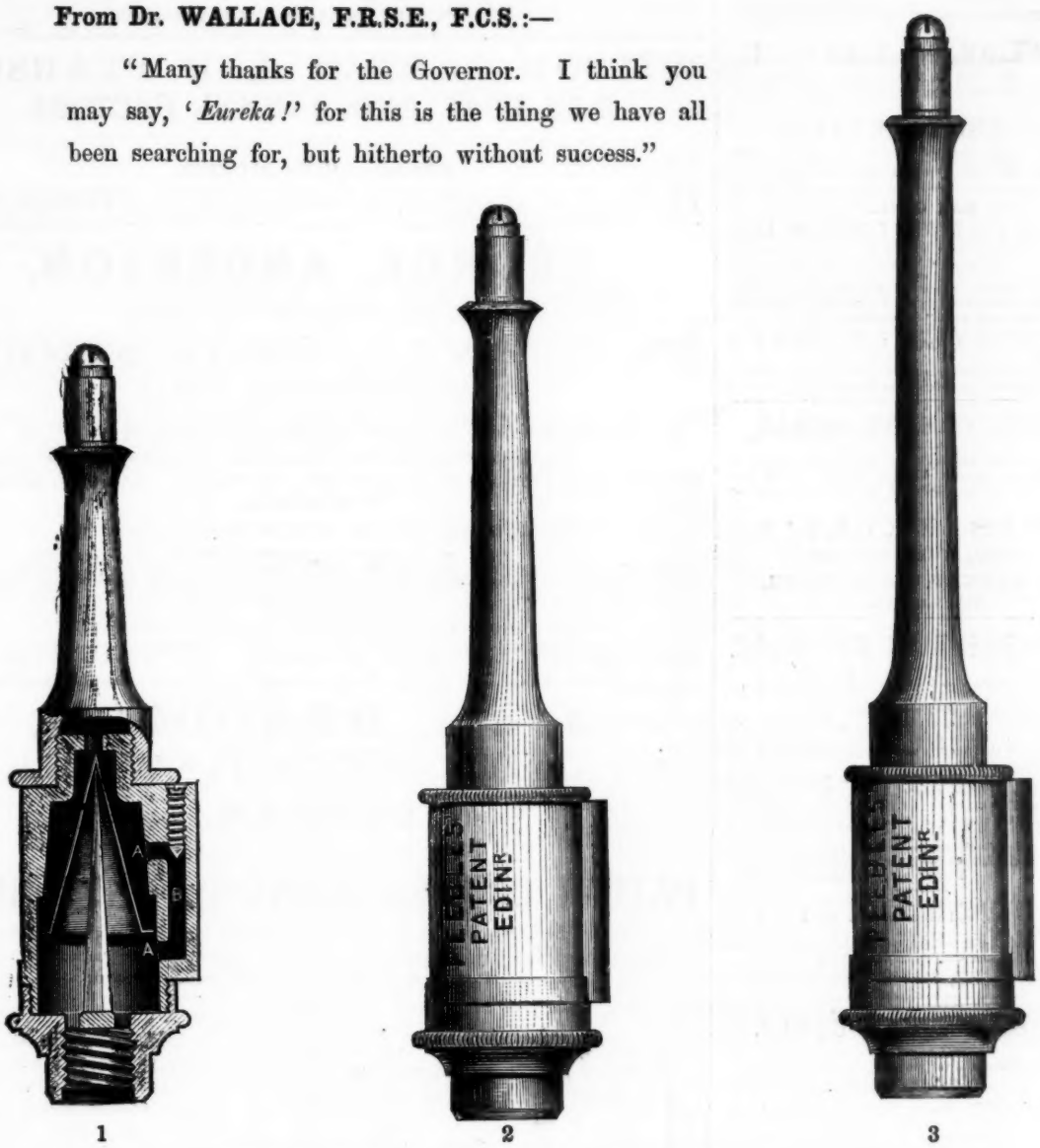
They contain their own engine power, requiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

Applications relating to dimensions and prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

PEEBLES'S PATENT NEEDLE GOVERNOR.

From Dr. WALLACE, F.R.S.E., F.C.S.:—

"Many thanks for the Governor. I think you may say, '*Eureka!*' for this is the thing we have all been searching for, but hitherto without success."



1 2 3

D. BRUCE PEEBLES & CO.,

TAY WORKS, BONNINGTON, EDINBURGH,

Inventors and Patentees of the System of Controlling the Action of Gas Governors by Pneumatic Pressure instead of Weights, beg to call the attention of Gas Engineers to their

NEW PATENT

METALLIC NEEDLE GOVERNOR

FOR

PUBLIC LAMPS, STAIR-LIGHTS, RAILWAY STATIONS, HOTELS, CHURCHES, HALLS,

AND ALL PLACES WHERE AN UNVARYING CONSUMPTION OF GAS IS REQUIRED.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

198, ST. VINCENT STREET, GLASGOW.

SHOTT'S BOGHEAD.

LOTHIAN'S CANNEL

Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash.

OLD WEMYSS CANNEL

Yields 13,320 cubic feet of 32·5-candle gas per ton.

Prices and full Analyses on application.

GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

SCOTCH CANNEL COALS.

The Subscriber is prepared to contract for the supply of all the principal SCOTCH CANNEL COALS. Prices and Analyses of the various Coals will be forwarded on application.

JAMES M'KELVIE,

CANNEL COAL MERCHANT,

HAYMARKET, EDINBURGH.

Established 1840.

DEAN'S PRIMROSE GAS COALS.

South Metropolitan Gaslight and Coke Company, London, July 12, 1878.

The Owners of the Dean's Primrose Colliery.

Dear Sirs,—I have much pleasure in stating that this Company have regularly used your Coals for more than thirty years, and that in all essential particulars they give the most satisfactory results.

The yield of Gas is from 9700 to 9800 feet per ton, of full 16 candles illuminating power, tested by the London Referees Standard Burner; and the Coke is of very good quality, while the quantity is about 40 bushels to the ton of Coal.

I consider Dean's Primrose Coals to rank amongst the first-class Gas Coals from the Durham Coal-Field.

Yours truly, GEORGE LIVESEY.

These Coals are also used by The Gaslight and Coke Company (London), and other English and Foreign Gas Companies.

Steamers loaded with quick despatch in the River Tyne.

Price and other terms on application at the

FITTING OFFICE, NEWCASTLE-ON-TYNE.

HOLMSIDE GAS COALS.

South Metropolitan Gaslight and Coke Company, 589, Old Kent Road, London, S.E., Oct. 9, 1873.

At the request of Mr. Hedley, the owner of the Holmside Colliery, I have much pleasure in stating that, for about ten or twelve years past, this Company has taken at least half of its supply of Newcastle Coal from him. I can, therefore, confidently bear testimony to the good quality of the Holmside Coals, and consider they are equal to the best of the Newcastle Coals, in proof of which I may state that this year we are using those Coals exclusively, that the yield of Gas is from 9700 to 9800 feet per ton, and that the quality of the Gas, without any admixture of Cannel, is over 16 candles, as tested by the officer appointed by the Metropolitan Board of Works, using the London Gas Referees test.

The Coke is of excellent quality, and in quantity amounts to about 40 bushels from a ton of Coal.

The annual consumption of Coal amounts to about 75,000 tons.

GEORGE LIVESEY, Engineer and Secretary.

P.S.—I am at this date, Feb. 15, 1875, still using Holmside Coals as largely as ever, and am quite as well pleased with them as when I gave the above certificate.

GEORGE LIVESEY.

We are this year, 1878, using 80,000 tons of Holmside Coal. GEORGE LIVESEY.

FITTING OFFICE:

Address, 75, QUAYSIDE, NEWCASTLE-ON-TYNE

M. BREMOND'S NAPHTHALINE PROCESS.

All negotiations respecting M. Brémond's patented process for preventing Deposits of

NAPHTHALINE

in Gas Main and Service Pipes should be addressed to Mr. W. H. BENNETT, 22, Great George Street, WESTMINSTER, S.W., or to M. BREMOND, Gas Engineer, Companie Madrilena de Alumbrado y Calefaccion por Gas, MADRID, who may be consulted upon all matters connected with the Gas Industry.

FERRAND DAVIES,

148 GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.,

AGENT FOR

THOMAS BARR'S LESMAHAGOW MAIN CANNEL,

AND

NEWTON, CHAMBERS, & CO.'S SILKSTONE GAS COALS.

Analyses and Quotations on application.

WILSON CARTER AND PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station or for Export all kinds of Fuel for Gas purposes.

Address—CHIEF OFFICES:

TEMPLE BUILDINGS, 50, NEW STREET, BIRMINGHAM.

GEORGE ANDERSON,

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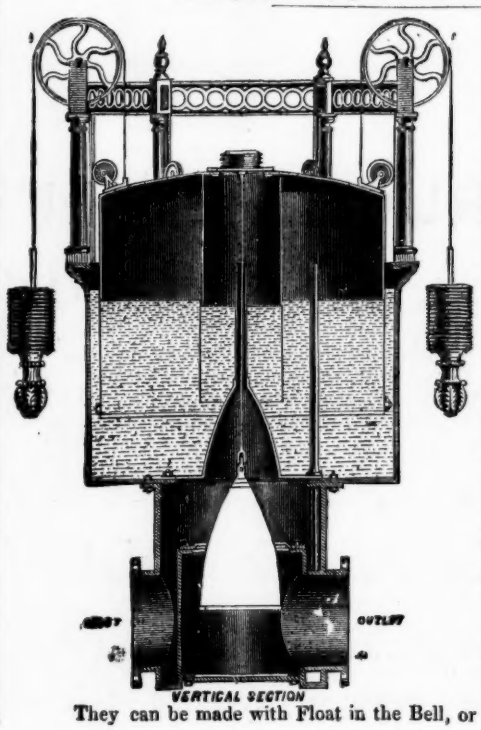
PATENT COMPENSATING GAS GOVERNOR,

Which is designed to give an uniform pressure at the Outlet to the Main at all draughts up to the full quantities which the Governors are made to control, such outlet pressure being less than the initial pressure.



VERTICAL SECTION

The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.

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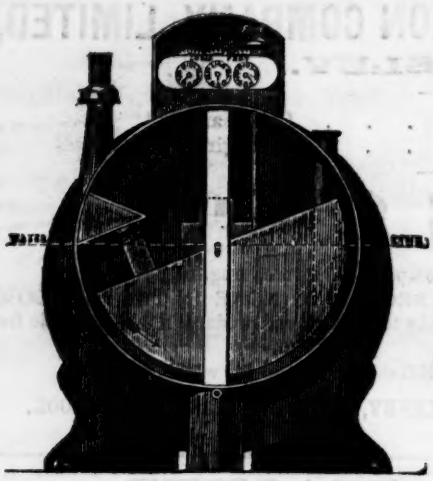

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